Land Records and
Agriculture, Bengal,
Agricultural Branch
report

1901-02 to 1909-10

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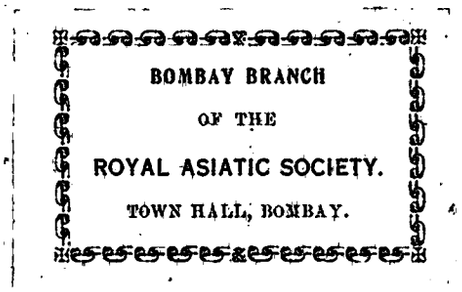

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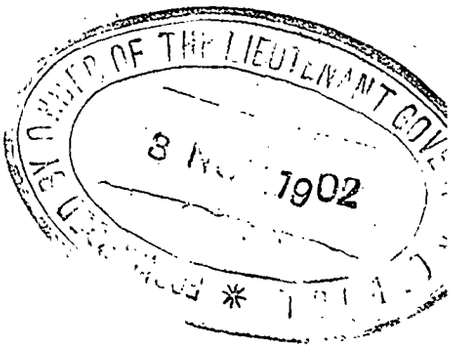

OF THE

AGRICULTURAL BRANCH

OF THE

DEPARTMENT OF LAND RECORDS AND AGRICULTURE,

133034

# of BENGAL,

For the year ending 31st March 1902.

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[Maximum limit, 20 pages.]

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DEPARTMENT OF LAND RECORDS AND AGRICULTURE, BENGAL.

No. 1302A.

FROM C. G. H. ALLEN, ESQ., I.C.S.,
Offg. Director of Land Records and Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE, L. P.

Dated Calcutta, the 23rd June, 1902.

SIR,

I HAVE the honour to submit the report of the Department of Land Records and Agriculture, Bengal, for the year ending on the 31st March 1902. This is the seventeenth annual report that has been submitted by this Department on the subject of the work done under the heads of agricultural enquiry, agricultural experiments, and agricultural improvements. The present report has been prepared in accordance with the orders contained in letter No. 92—298—5, dated the 20th January 1902, from the Government of India, Revenue and Agricultural Department, copy of which was forwarded to this office, with the Board's letter No. 47A., dated the 6th February, 1902, and all reference to Land Records has been omitted from it.

CHAPTER I.

PREFATORY.

2. Mr. P. C. Lyon, I.C.S., was in charge of the Department up to the 4th November 1901, when I relieved him. In April, Mr. Lyon visited Berhampore and Rampur Boalia to inspect sericultural operations. I visited the Kalimpong *mêla* in November 1901, and the Khagra *mêla* in February 1902. I also saw the Chittagong Farm and Pusa, and inspected Veterinary Dispensaries at Dumka, Gaya, and Cuttack. In March 1902, I visited Berhampore and Malda, in order to see the work done by the Silk Committee, and accompanied Mr. Mollison, Inspector-General of Agriculture, to Dalsingserai, where we saw Mr. Coventry's agricultural experiments. During the past financial year Mr. Lyon was on tour for 41 days and myself for 119 days.

Mr. Debendra Nath Mookerji was Assistant Director, and Babu Girish Chunder Dutt, Personal Assistant on the Agricultural side, throughout the year.

In the report, which follows no mention is made of subjects discussed in last year's report with regard to which no action has been taken during the present year.

CHAPTER II.

SCIENTIFIC AND NATIONAL ENQUIRY UNDER IMPERIAL CONTROL.

Sola (Æschynomene).

3. The officiating Reporter on Economic Products to the Government of India now informs me that the article on *Æschynomene* (*sola*) prepared by Dr. Watt, is still under revision, with a view to early publication in the handbook which he proposes to issue.

Betel-leaf (Piper betel, pán).

4. The Reporter informs me that a definite determination of Botanical specimens of *pán (piper betel)* has not as yet been completed, and that the report on this product cannot therefore be written.

Betel-nut Plague in East Bengal.

5. The conclusions arrived at by Dr. Watt after investigating this disease are stated in Agricultural Ledger No. 8 of 1901. He attributed the disease to a pathological condition known as Tyloses brought about by unfavourable climatic states. This disease is probably caused by the deprivation of moisture from tissues that normally possess a large quantity of water.

Prospects of the Indian Sugar Industry.

6. As promised in paragraph 18 of last year's report Mr. P. C. Lyon reported to Government in November 1901 that there had been no general increase in the area under sugarcane, except in North Bihar, though the marked improvement in the sugar-refining industry observed in 1900 had been maintained. He pointed out that the rise in prices which had caused this improvement was at least partly due to temporary causes, such as the failure of the 1899 beet crop in Europe and of the sugarcane crop in India, as well as the effects of the recent severe famine in Western and Central India. He also drew attention to the great revival which had taken place in the import of foreign sugar, and reserved his opinion upon the effect of the imposition of the countervailing duties. The enquiries into this subject are being continued, and the further report called for by the Government of Bengal will be submitted in due course.

Jute.

7. The Reporter on Economic Products has promised to furnish me shortly with a statement showing the results of his examination of the specimens of the various kinds of jute collected and forwarded to him by this Department.

An enquiry has been started, at the instance of the Jute-Balers' Association, Calcutta, into an alleged deterioration of jute. Under instructions from the Inspector-General of Agriculture, experiments are being made at the Burdwan and Chittagong Farms with selected seed to elucidate the following points:—

(1) Whether the quality of the fibre varies with the variety of jute grown ?
(2) At what stage of growth should the crop be harvested to give the best fibre ?
(3) Does a well-grown crop, obtained from good suitable manured soil, produce better fibre than a middling or inferior crop ?
(4) Are the quality of fibre and outturn affected by thick and thin sowing, and to what extent ?
(5) What is the effect of sowing sound well-matured seed produced from healthy vigorous plants, in comparison with seed produced from a crop thickly sown for fibre?
(6) The quality of water and temperatures most suitable for retting. Is fresh water more suitable than stagnant ? Can the retting process be improved in any way under such conditions as are ordinarily obtainable ?

Dioscorea (yams).

8. The Reporter on Economic Products to the Government of India now informs me that the investigations on the subject of yams (*dioscorea*) have not yet been completed, and that the preparation of an agricultural ledger on the subject cannot, therefore, be undertaken at present; and, as the plants under cultivation at the Royal Botanic Gardens are obstinate about flowering, it will not be ready for some time.

Chemical analyses of Indian food-grains and fodder by Dr. J. W. Leather, Agricultural Chemist to the Government of India.

9. The Agricultural Chemist to the Government of India informs me that the analyses of food-grains have been completed, and their results have been

submitted to the Inspector-General of Agriculture for publication as an agricultural ledger. He proposes to send me a proof of the ledger to check the vernacular names in it.

Enquiry regarding the supposed injurious effects of well-irrigation in certain tracts in North Bihar.

10. The experiments which are necessary to elucidate this question have not been made. The Assistant Director has recently visited Champaran and is drawing up a programme of experiments.

Collection of articles for the Indian Museum and the Imperial Institute, London.

11. During the year a few specimens of economic products were collected by this Department through its travelling overseers for the Imperial Institute, London, and were forwarded to the Reporter on Economic Products to the Government of India.

Bengal Veterinary Department—Cattle-breeding.

12. The annual report of the Civil Veterinary Department, Bengal, will be separately submitted to Government. In order to improve the breed of cattle in Patna, two bulls and four cows of Ayrshire breed were imported from Brisbane, at a cost of Rs. 5,170-9. The cattle were sent to the Sripur Cattle Farm to be acclimatized. Unfortunately one bull died on the way to Sripur of heat-apoplexy, and one cow has since died of impaction of the colon. The remaining cattle are healthy, and will shortly be sent to Bankipore.

A sum of Rs. 2,500 was specially sanctioned by the Government of India to be awarded in prizes at cattle fairs. Sums of Rs. 500 were awarded for distribution to the fairs at Sonepur, Kalimpong, Barahpur, Suri, and Sitamarhi. The total sum awarded was only Rs. 1,097-10, as suitable animals did not compete for the balance of the money offered. The conditions of awarding these prizes are under consideration. The grant was sanctioned too late in the year to be sufficiently advertized.

CHAPTER III.

SCIENTIFIC AND LOCAL ENQUIRY UNDER PROVINCIAL DIRECTION.

Experimental and Demonstration Farms.

13. There are, strictly speaking, only two Research Farms, at Burdwan and Dumraon. The Sibpur Farm is maintained as a practical training ground for the agricultural students of the Sibpur College. The Sripur Cattle Farm contains about 15 acres devoted to experimental cultivation. The Chittagong Farm is a demonstration farm, while the farm at Tikari is maintained principally as a dairy farm.

Burdwan Experimental Farm.

14. The Burdwan Farm was cultivated successfully. The rainfall was in slight defect, 50·84 inches being registered, as compared with a normal fall of 55·13 inches. Of the total area of 31 acres, 10 acres were experimental, and 15 acres were non-experimental, while 6 acres lay fallow or occupied by office godown, coolie and cattle-sheds, &c.

I.—Manure experiments were conducted with paddy, jute, sugarcane, and potatoes.

(*a*) *Paddy.*—The highest outturn was again obtained by using a mixture of bonemeal (3 maunds per acre), and saltpetre (30 seers per acre), as has uniformly been the case since 1891-92. The outturn of grain was 4,566 lbs., or more than three times the average of the unmanured plots (1,496 lbs.), giving a net profit of Rs. 108 per acre against Rs. 18-12 from the unmanured plots. Bonemeal alone also gave excellent results. Six maunds of it per acre gave an outturn of 4,090 lbs. of grain and a net profit of Rs. 89.

In a second series of manure experiments with paddy, bonemeal alone (9 maunds) gave the highest outturn (3,828 lbs. of grain) and profit (Rs. 93) per acre. Saltpetre by itself ($3\frac{1}{2}$ maunds) gave an outturn of 3,012 lbs., and a net

profit of Rs. 66. One of the three plots in this series in which a mixture of bonemeal and saltpetre is being tried, gave an outturn of 3,638 lbs. of grain and a net profit of Rs. 87. The other two plots, however, did not do so well, though each gave a clear profit of about Rs. 50 per acre. Comparison in this experiment was vitiated by the fact that the so-called unmanured plot had been for years heavily manured for sugarcane.

In the green manure experiment with paddy the effect of green manuring with jute plants is being contrasted with 50 maunds of cowdung per acre on the one hand, and no manure on the other. During the year under report the following results were obtained:—

	Outturn of grain.	Net profit.
	lbs.	Rs.
Jute ploughed in	... 3,021	65
Fifty maunds cowdung ...	... 2,407	49
No manure	... 1,660	30

(*b*) *Manure experiment with jute.*—A better outturn of fibre was obtained in all the plots than in the previous year (1900-1901), but owing to the low price obtained for the fibre, Rs. 3-12 per maund in 1901-1902 against Rs. 6-4 in 1900-1901, the financial results were not satisfactory. The cowdung plot (150 maunds per acre) again gave the highest outturn of fibre (2,054 lbs.), as it has uniformly done for the last 12 or 13 years. The net profit on this plot was Rs. 14 per acre, while in 1900-1901, with an outturn of 1,997 lbs. of fibre, the net profit was no less than Rs. 64 per acre. On the bonemeal plot the value of the outturn (1,821 lbs.) just balanced the cost of cultivation and manuring, but on the castor-cake plot with an outturn of 1,600 lbs. there was a net loss of Rs. 12 per acre.

(*c*) *Manure Experiments with sugarcanes.*—A mixture of cowdung and bonemeal (300 maunds of the former and 45 maunds of the latter per acre) gave the fine yield of 126 maunds of *gur* per acre. Cowdung alone (600 maunds per acre) gave 96 maunds, while bonemeal (92 maunds) by itself gave as much as 118 maunds of *gur* per acre. The site for these experiments was changed from water-logged ground to a higher level. But though the outturns were so good, the net profit in the first case was only Rs. 70, and in the other two cases only Rs. 64, and Rs. 19, respectively. This was due to the market rate for *gur* being only Rs. 3-12 against Rs. 5 per maund during the previous year.

(*d*) *Manure experiment with potatoes.*—Bonemeal (12 maunds per acre) and castor-cake (36 maunds per acre) gave an outturn of 228 maunds and 260 maunds per acre, respectively. The net profit in either case was about Rs. 260. Cowdung (1,200 maunds per acre) gave an outturn of 214 maunds, and a net profit of Rs. 193. Since the begining of the series in 1894-95, castor-cake has uniformly given the highest yield.

Green manuring was tried with potatoes for the first time. Four plots were taken for this purpose and treated as follows :—

(1) Green manured with *dhaincha* (*Sesbania aculeata*) alone.
(2) Ditto and cowdung 600 maunds.
(3) Ditto and castor-cake 18 maunds.
(4) Ditto and bonemeal 6 maunds.

It will be seen that the quantities of cowdung, castor-cake and bonemeal added were half the quantities of these manures used in the 1st series, the object being to ascertain to what extent a leguminous plant ploughed in, could take the place of other manures. The results are given below :—

Plot.	Yield per acre.	Net profit per acre.
	Mds.	Rs.
(1)	155	78
(2)	192	123
(3)	210	143
(4)	185	117

The outturn and financial results suffer by comparison with the 1st series. But the plots were new and the experiment will be tried again.

II.—Trials with Implements.—The Sibpur soil-inverting plough gave, with and without manures, 3 or 4 maunds of paddy more than the common country plough. With 3 maunds of bonemeal per acre, for instance, the country plough gave an outturn of 33½ maunds of grain, while the Sibpur plough gave an outturn of 38 maunds. The net profit in the 1st case was Rs. 58-8, and in the 2nd case Rs. 66. This was in confirmation of the results previously obtained.

III.—Methods of Cultivation Experiment—

Two experiments were made with paddy:

Thick sowing with 60 lbs. of seed per acre gave about 31½ maunds grain per acre against 27¼ maunds from thin sowing at the rate of 30 lbs. seed per acre. The straw from the thick sown plots was 83 per cent. in excess of that from the thin sown plots. The net profit (from grain and straw) was Rs. 62-10 against Rs. 46-5. No manure was used.

The value of seed selection was again proved, the average outturn from unselected seed being 2,400 lbs. against 3,120 lbs. from selected seed. Selection increased the net profit from Rs. 47 to Rs. 71 per acre.

In the potato-planting experiments of whole tubers *versus* cut sets, the results again confirmed those previously obtained. Cut sets from 15 maunds generally gave the best outturn.

IV.—Experiments with Imported Varieties of Crops.—In the paddy series the local fine *basmati* variety again gave the highest outturn, as it has so often done. The Diamond Harbour fine paddy also did very well. Peshawar paddy was also tried, but the outturn was not satisfactory. It will be tried again.

In the potato series the *Amragachi* variety (acclimatized Patna) with fresh seeds of middle size sown at the rate of 6 maunds per acre, gave the highest outturn (280 maunds) and profit (Rs. 208) per acre, while farm-preserved seeds of the same variety sown at the same rate gave only 180 maunds per acre, and a net profit of no more than Rs. 66. The Naini Tal variety (sown 15 maunds per acre) gave 175 maunds as outturn, and Rs. 74 as net profit.

Seed Distribution.—Over 100,000 sugarcane cuttings and about 30,000 whole canes were distributed from the farm for planting besides 16 maunds of hill potatoes.

The manure experiments in this Farm which have now been conducted for a series of years show clearly that a high rate of profit is to be obtained by applying carefully selected manures to crops of rice, sugarcane and potatoes. The value of green manuring is especially significant, as this form of manure costs nothing but seed and labour, and is within reach of the poorest. I am informed that it is largely resorted to in Bombay. The sugarcane grown on the farm has a good reputation, and has been in brisk demand for Bihar.

Balance Sheet.—The expenditure of the farm amounted to Rs. 2,379 and the receipts to Rs. 1,894, so there was a net loss of Rs. 485.

This is a very small cost to incur on a Research Farm.

Dumraon Experimental Farm.

15. The cultivation on this farm was not satisfactory; the Overseer who is deficient in practical knowledge will be removed. The rainfall was 39 per cent. below normal, the fall being only 25·76 inches.

The year was very unfavourable to agriculture. A weak monsoon was followed by a five months' drought from the second week of October. Some of the *rabi* crops again were seriously damaged by an insect, locally known as the *katui.*

Manure experiments were carried on with paddy, wheat, sugarcane, and potatoes.

The paddy experiment was a partial failure owing to late transplantation. The manures were supposed to contain 25lbs. of nitrogen per acre, but there was no analysis.

For wheat various manures, supposed to contain 50lbs. nitrogen per acre, were tried, and also green manuring with hemp (*crotolaria juncia*) *mung* (*phaseolus mungo*) and indigo.

There was no rust this year, and the outturns were better than in the two previous years. Cowdung (93 maunds per acre) gave the highest outturn (1,020lbs. grain), with a profit of Rs. 17-4-8 per acre, as compared with 390lbs.

and a loss of Rs. 5-13-9 on the unmanured plot. Green manuring was unsuccessful, as the crops ploughed in were insufficiently decomposed for want of rain.

For sugarcane the manures were the same as in the wheat experiment, though there was no green manuring. Cowdung and castor cake gave the highest result, 3,715 lbs. of hard *gur*, and a net profit of Rs. 40 per acre, as compared with 1,940 lbs. and a profit of Rs. 8-4-6 from the unmanured plot.

These results compare unfavourably with those of Burdwan. The reasons are that the quantities of manure applied at Dumraon are too small, and the cultivation inferior. A fresh scheme of experiments has been drawn up by the Inspector-General of Agriculture, and will be worked next season.

In the manure experiment with potatoes, cowdung (95 maunds per acre) gave 109 maunds of potatoes, and double the quantity gave 115½ maunds of potatoes. The outturn was fair, considering the small quantity of manure used, but the result was unprofitable, owing to the high cost of irrigation and the low prices obtained.

Trials with improved Agricultural Implements.—The Sibpur plough was the only implement tried. The two ploughs were tested both on paddy and wheat. The results showed as before that the Sibpur soil-inverting plough is better than the native plough for wheat, but worse for paddy. The reason is, perhaps, that a wooden share clogs less in soft mud than the Sibpur iron share.

Experiment in methods of cultivation.—Two experiments were tried with sugarcane, viz., the Mauritius *versus* Country system of planting canes, and a ratooning experiment with *khari* canes. Both experiments failed. Too little manure was used, and the trenching was not properly done.

The ratooning experiment was a failure due to blanks. This experiment will also be remodelled from next season.

At the suggestion of the Government of India wheat seed which had been kept for two years was tried for its supposed rust-resisting quality. There was no rust on the farm this year, so the experiment was inconclusive.

New crops and new varieties of crops.—Experiments were made with varieties of paddy, wheat, potatoes, sugarcanes, mustard, and maize.

All these experiments failed except the paddy variety experiment. In this the same five varieties were tried as in the preceding years, together with a new variety of sweet-scented paddy from Burdwan. As in the previous year the Burdwan *Jetakulma*, a course variety, gave the largest outturn (1,720lbs. of grain), but a local *Bansmati* rice gave the largest profit of Rs. 22-13-5 per acre.

Balance sheet.—The total receipts were Rs. 793 and the expenditure Rs. 2,514, so there was a net loss of Rs. 1,721.

Sibpur Farm.

16. In spite of the unfavourable character of the season, the crops were much better than in previous years, and the income of the Farm was more than doubled. The improvement was due to the good work done by the Overseer, Babu Kali Das Roy. The manure experiments of the Farm proved the great value of *dhaincha* (*sesbania aculeata*) as a green manure for potatoes. Five tons to the acre were obtained from a plot green manured with *dhaincha*, and further manured with 20 maunds of castor-cake. *Dhaincha* itself is a fodder and fibre crop and the sticks after the extraction of the fibre are used as stakes of *pán* gardens. The apatite experiment of the Farm this year confirmed its value as a manure though its utility is not so marked, as it is in the case of a quick-acting manure like castor-cake. The value of saltpetre as a manure for oats and cabbages was again demonstrated. The prolificness of Cape oats, the undesirability of mixed crops, and the advantage of thin sowing or planting at least for seed purposes are other results of the experiments carried on in the Farm during the past year.

The paddy experiments, continued during the year, gave better results all round.

A large variety of crops was again grown in this Farm in small plots for demonstration to the students of the agricultural class and to afford them an opportunity of handling the crops and learning methods of cultivation.

The Aermotor set up in the Farm has not yet been utilised for pumping, owing to delay in the re-arrangement of the drainage of the Farm, which is not yet completed.

The income of the Farm during the year was Rs. 1,640-3-3, as compared with Rs. 753-10-2½, and Rs. 744-13-6 during the two preceding years. The expenditure was Rs. 3,495-0-2, as against Rs. 3,064-15-1, and Rs. 3,452-0-1 in 1900-1901 and 1899-1900.

Sripur Farm in Saran.

17. This Farm of 900 acres is maintained by the Hathwa Raj, as a Cattle Farm, 25 acres being set apart for experimental cultivation.

The crops experimented with were maize, fodder grasses, potatoes, wheat, oats, castor and sugarcane—

The local varieties, white and red maize, were contrasted with American and Jaunpur maize. All the plots were manured with 30 maunds of cowdung per acre. Both the imported varieties yielded better results than the local varieties. It is satisfactory to note that American maize which failed to germinate in any of the Farms in Bengal, gave a good outturn of grain and straw in this Farm.

Five varieties of fodder grasses were experimented with. The following table gives the names of the varieties and the outturn obtained per acre from each of them—

	Mds.	Srs.
Juar (*Sorghum vulgare*)	632	30
Reana luxurians	403	20
Sorghum Saccharatum	420	30
Maize (local)	239	...
Guinea grass	227	14

The potato crops proved a failure, while the other crops have grown fairly well. Good crops of maize, fodder grasses, wheat, linseed, barley, castor, sugarcane and oats were cultivated in the non-experimental area of the Farm.

During the year the Farm was stocked with bulls and cows of Hansi, Gujrati, Sind, and Nellore breeds, and breeding operations commenced. A number of country cows were served free of charge by the imported bulls. The cattle were kept in excellent condition, and the Farm was well managed by the Superintendent, Mr. N. N. Banerji.

18. *Tikari Home Farm.*—The Home Farm continued to work during the year under the supervision of the overseer who is a graduate of the Saidapet College of Agriculture, Madras. The buildings of the Farm are now complete with the exception of a dairy room. The Farm comprises 30 acres, of which 15 acres are cultivated, and 12 acres are under pasture. The soil is a heavy clay. Dr. Leather's analysis described the soil as poor in plant-food and requiring phosphate and nitrogenous manures.

In spite of an unfavourable season Canadian oats, Dumraon oats, maize, Darbhanga tobacco, and lucerne yielded a good outturn. The *samsara* variety of sugarcane gave the best result and cuttings were distributed free of charge to raiyats in the neighgbourhood. Fodder crops generally did well. The Farm has at present 8 she-buffaloes and 1 stud buffalo of Gujrati breed, and dairy produce is supplied to local residents.

Chittagong Farm.

19. The history of the Chittagong Farm is of great interest, as it shows what can be done in a district with large Government and Wards' estates by concentrating the Funds allotted for agricultural experiments from the collections of these estates. The total expenditure during the year was Rs. 10,213, of which Rs. 3,136 was capital expenditure on reclamation and drainage, and Rs. 2,736 was spent for acquiring lands. The ordinary recurrent expenditure was, therefore, Rs. 4,341. The expenditure was met by a grant of Rs. 9,113 from the 3 per cent. allotment on Government estate collections, supplemented by a contribution of Rs. 1,100 from the similar allotment for Wards' estates. The receipts were Rs. 997 not including unsold crops valued at Rs. 500. The area of the Farm under cultivation is now 25 acres. To make the Farm pay it is probably necessary to double this area.

This Farm is situated in the neighbourhood of the town of Chittagong, and continued to attract much attention during the year under report. The soil is representative of the average soil of the district, but it has cost a great

deal to level, irrigate and reclaim. A stream has been dammed and the water collected in a reservoir provided with a masonry sluice and weir. A bungalow was acquired during the year. Sugarcane, potatoes, and a fine *aus* paddy imported from the Central Provinces were successfully grown. Cuttings of the *Samsara* cane were in brisk demand. Potatoes did fairly well, though the tubers were spotted. This crop is likely to spread in the district. Jute grew well, but was over-steeped. Arrangements have been made for carrying on some experiments for improving the fibre under the directions of the Inspector-General of Agriculture. The cultivation of *bhadoi* sunhemp was very successful. This is grown as a *rabi* crop in the district, and the *bhadoi* crop will probably be popular. *Arhar* (*cajanus indicus*) also grew very well, but had not been harvested at the time of the Collector's report. It throve on the hillocks which in Chittagong bear nothing but thatching grass, and may prove a valuable introduction. But the crop that attracted the greatest attention from the public was the vegetable *patal* or *palbal* (*trichosanthes dioica*). The demand for roots was keen and could only be partly satisfied. Wheat, oats, maize, and gram were also tried, but without much success.

The farm was started by Mr. J. H. Lea, the Collector, and its success is mainly due to his close supervision. Babu Romes Chander Sinha, the Sadar khas-tashildar also took great interest in the management of the Farm.

Agricultural Experiments in Government and Wards' Estates.

20. A sum equivalent to 3 per cent on the collections in Government estates is set aside annually in each district for agricultural and sanitary improvements, and similar allotments are made in Wards' estates. The greater part of this money is spent in works of permanent utility, such as embankments, tanks, &c., but a portion is set aside in many districts for "agricultural experiments." These so-called experiments are mainly attempts to introduce hill potatoes, English vegetables and varieties of sugarcane. They are conducted on a small scale, and the degree of success attained depends on the interest taken by the Estate Manager. These experiments frequently fail from neglect and want of supervision, the cultivation being generally decidedly inferior to that practised by the ordinary raiyat. The money spent is to a large extent wasted at present.

Much more supervision over this expenditure is necessary. The Department should be in a position to give advice, after local enquiry by its officers as to the land to be selected for cultivation, the crops to be grown, the manures to be used, the season for planting, and generally the whole scheme of cultivation. The land selected should be visited while the crops are growing so that instructions may be given and defects observed for future guidance. To enable me to do this, it will probably be necessary to increase the number of Travelling Overseers.

I believe that concentration of funds would also yield better results; it would certainly facilitate supervision. The Farm at Chittagong is a good example of what can be done in this direction. The Farm is maintained principally from sums allotted for expenditure in the several Government and Wards' Estates in the district. Situated close to the head-quarters station, it is under the eye of the Collector, and attracts much notice from residents in the neighbourhood. As is shown elsewhere this Farm has given excellent results and I strongly recommend District Officers to start similar Demonstration Farms elsewhere where funds permit.

BURDWAN DIVISION.

21. Very little was done in the way of agricultural experiments in this division. In Midnapore, potatoes were grown in the compound of the khas tahsil office at Kukrahati, and seed potatoes were also distributed to some selected tenants for cultivation. The cultivation of potatoes in the Bankura jail garden and of sugarcane in the khas mahal in the Serampore subdivision of the district of Hooghly proved unsuccessful.

PRESIDENCY DIVISION.

22. Potatoes were cultivated with fair success in some of the Government estates in the districts of the 24-Parganas, Murshidabad, Jessore, and Khulna.

In the Port Canning Government estate in the 24-Parganas, the Sub-Deputy Collector in charge obtained a yield of 150 maunds per acre, twenty-fold the seed sown. The success of experiments in the khas mahals of the Sadar and Bagerhat subdivisions of the district of Khulna has induced raiyats to try this crop. Gram, oats, and wheat were also tried, but with indifferent success.

RAJSHAHI DIVISION.

23. Sirajganj jute, Patna potatoes, and Cooch Behar tobacco were cultivated with considerable success in the Jaipur Government estates, in the district of Bogra. The success of these experiments is mainly due to the intelligent interest taken in them by the Manager of these estates. The raiyats are keen on growing Patna potatoes. The *khari* variety of sugarcane was ratooned on a large scale and is growing well. Four sugarcane mills belonging to the estate were let on hire on easy terms to the raiyats, who much appreciate the machine, and it is proposed to purchase more machines for their benefit. One Bihari bull and two Hissar bulls were kept on the estate for breeding purposes. The Bihari bull gave several coverings. The Hissar bulls were found useless, and have been returned to the Civil Veterinary Department. In the Maldwar and Churaman Wards' estates in Dinajpur, Ambala potatoes, Muzaffarnagar and Buxar wheats and English vegetables were cultivated with fair success. The Hissar bull, which was supplied to the Maldwar estate, was unfit for breeding purposes, and has been returned to the Veterinary Department to be replaced.

In the Government estates in Pabna, Naini Tal potatoes were tried, and although the result was not encouraging the agriculturists of the neighbourhood are anxious to try the crop this year.

In Darjeeling, fifty-four maunds of Naini Tal potato seeds were distributed for experimental cultivation to eight European gentlemen. It is too early yet to state the result of this experiment. Thirteen *Seri* bulls were kept at stud in the Kalimpong and in the West Tista khas mahals during the year. It was found necessary to shift these bulls to prevent interbreeding.

DACCA DIVISION.

24. *Faridpur.*—Patna potatoes were successfully cultivated in the khas mahals, but the Naini Tal and Umballa varieties failed because they were sown late. Patna gram was tried in the khas mahal garden, but the soil did not suit it. Sugarcane is thriving well, and radishes and Spanish onions did well.

Backergunge.—The cyclone of November 1901 ruined the potato crop and English vegetables grown in the Government and Wards' Estates. Rangpur tobacco was tried in the Dakhin Shabazpur Estate but failed owing to the ignorance of the *mali*, who was brought from Rangpur for this work. The travelling overseer appointed for the Backergunge district has made a good start. The Commissioner Mr. Savage remarks:—

"This season, at least at Daulat Khan, there has, however, been a great improvement due to the instructions given by the overseer, and considering the improvement effected in the short time he has been employed, I think we may confidently look forward to successful cultivation of potatoes and other cold weather crops from European seeds in the Court of Wards' and Government estates, and if we can show success, I believe the raiyats will not be slow to avail themselves of the opening for adding to their present meagre bill of fare."

CHITTAGONG DIVISION.

25. *Chittagong.*—Sugarcane, tobacco, chilly, potato and English vegetables were grown with indifferent results.

Noakhali.—Naini Tal, Umballa and Amragachi potatoes, tobacco, gram, peas and oats grown on the Government and Wards' Estates in this district were damaged by rain in November. Some fine aman paddy grown in the estate of Girindra Kumar Mozumdar gave a fair crop.

PATNA DIVISION.

26. *Patna.*—In the Government estates in the Bihar Subdivision of this district, agricultural experiments were made with Umballa potatoes

and some fruit and flower trees were also planted with fairly satisfactory results. Jaggery was successfully manufactured in the village of Dharampur Bara, in the Bihar subdivision, under a new process recommended by the Agricultural chemist of Mysore, which improved the flavour, colour, and sweetness of the product. Sabai grass supplied by this Department in 1900-1901 and planted in the office compound of the Manager, Wards' Estates, grew well and supplied seed plants for distribution to the raiyats of some large villages. Mayfurth's Hand-thresher, Spank's three-roller Sugarcane Mill and Thomson and Mylne's Sugarcane Mill were tested; the first-named machine did not prove satisfactory.

Gaya.—In Gaya experiments made in the Government Estates with Umballa potato and sugareane (red Bombay, *Khari* and *Shamshara*) proved unsuccessful. In the Tikari Wards' Estate, the tobacco crop was attacked by worms and sugarcane by white-ants.

Champaran.—In the Bettiah estate Naini Tal potatoes were grown on a small scale with satisfactory results.

Darbhanga.—The *dhoob* grass planted in 1899-1900 in the Pusa Government Estate did well, and the settlement of grazing and thatching grass fetched Rs. 3,500 rent.

In the Narhan Wards' Estate experiments with sugarcane, Naini Tal potato, Dumraon gram and oats and Muzaffarnagar wheat, failed for want of moisture. At Magardahi a well-irrigated crop of potatoes did well.

Bhagalpur Division.

27. *Monghyr.*—In the Government Estates in this district, experiments were made with Naini Tal potatoes, Muzaffarnagar wheat and *sona mug*. The potatoes and wheat did well; the *sona mug* had not been garnered.

Bhagalpur.—The cultivation of Naini Tal potatoes was tried in the Government Estates of Gaddi and Manikchand in the Supaul Subdivision of this district, but failed owing to bad cultivation by the raiyats who undertook to grow them.

In the Lugma estate two kinds of paddy and two kinds of sugarcane were tried. The experiment with paddy failed for want of rain. A fair outturn of *gur* was obtained, though the cane was damaged by white ants.

Purnea.—In the Khagra Estate, in Purnea, experiments were made with oats, Indian corn, potatoes, *janera* and English vegetables. The last two crops gave satisfactory results.

Sonthal Parganas.—In the Sankara Wards' Estate in the Sonthal Parganas, Patna and Umballa potatoes were grown with satisfactory results but an experiment with *Hingli* tobacoo failed.

Orissa Division.

28. Garo Hill and Nankin cotton, Serajgunj jute, *Samsara* and *Khari* sugarcane, Bombay and Cuttack potatoes, American and Jaunpur maize, castor seeds and various kinds of English and country vegetables were successfully grown in the Model Farm at Angul. The Farm was in charge of the Assistant-Surgeon, Babu Satis Chandra Mukherji, who takes great interest in, and deserves credit for, the success it has attained. *Surguja*, Dumraon *Arhar* and Mozaffarnagur wheat grew remarkably well, and are reported to be particularly suited to the soil of the district. Cuttings of *Samsara* and *khari* sugarcane and seeds of Garo Hill cotton, *surguja*, potato, maize and linseed, were distributed to a large number of tenants for experimental cultivation, and the crops were successful. Potato and sugarcane in the Kanika and Madhupur Wards' Estates in Cuttack and in the other Government estates were much damaged by the heavy rainfall of November last. The Raja of Hindol, in Cuttack, successfully cultivated *balam* paddy in his estate. Agricultural experiments were also conducted in some of the Tributary Mahals of Orissa, but reports have not been received from these estates.

Chota Nagpur Division.

29. Patna potatoes were cultivated in Ranchi with success. The result of the experimental cultivation of tobacco in Palamau Government estates is

not encouraging, but the Deputy Commissioner proposes to continue this experiment next year on better soil.

In Kolhan Government estate sugarcane has been successfully grown.

A small garden has been opened in village Markacho in the Dhargali encumbered estate to grow Patna potato, wheat, oil-seeds, and English vegetables. In the Nagarkiari Ward's Estate, in the district of Manbhum, the cultivation of potato and English vegetables proved a failure.

Good crops of Patna potato were grown in the encumbered estates in the district of Hazaribagh, where the soil suits this variety.

Agricultural Experiments by Private Individuals.

30. Mr. B. Pal Chowdhury, Zamindar of Moheshgunj, in the district of Nadia, grew a large variety of crops on his model farm. He got good results with peas, wheat, and pulses.

Babu Hem Chandra Mitter, the proprietor of the Cossipur Practical Institute of Agri-Horti- and Floriculture, exprimented with different varieties of sugarcane, fine and coarse varieties of paddy, Kabuli oats, wheat, *mung*, Guinea and Lucerne grasses, *Reana Luxurians*, water-melon and English peas in his farm at Mudhupur and Bombay and Naini Tal potatoes, Indian-corn and Sumatra and Havanna tobaccos in his garden at Cossipur. The results of his experiments in pulses, water-melon, Bombay potatoes, English peas, and Guinea and Lucerne grasses were very successful.

Babu Charu Krishna Mozumdar, zamindar of Islampore, in the district of Murshidabad, was very successful in his experiment with Patna potato. His continued success in this experiment has induced some of his neighbours to try its cultivation.

Babu Brajendra Kishore Rai Chowdhury, zamindar of Gouripur in the district of Mymensingh, has recently started an experimental farm of 16 acres which he proposes to extend hereafter. A student of the Sibpur Agriculture class has been appointed in charge of the Farm. Naini Tal potatoes, cabbages, cauliflower and turnips were grown during the year with encouraging results. Babu Isvar Chunder Guho, the proprietor of the Chaitanya nursery, in this district, who is an enthusiast in scientific agriculture was very successful in his experiments with the potato crop. He also distributed seed potatoes widely. His experiments with Garo Hill cotton, raddish, pumpkin and jute, met with success, and he also grew tobacco, rhea, cassava, and various kinds of vegetables.

Sugarcane Cultivation by the Indigo-planters of Bihar.

31. Cultivation of sugarcane was undertaken as an experimental measure by some of the indigo-planters in the districts of Champaran, Muzaffarpur and Darbhanga during the year under report. Cuttings of some of the best varieties of sugarcane grown in Bengal were supplied to them from the Dumraon and Burdwan Experimental Farms. Reports received from these gentlemen show that in spite of the unfavourable season, the canes grew well and yielded a fair outturn generally. The *samsara* variety of sugarcane which was supplied by the Burdwan Farm is much appreciated.

Trial of improved Agricultural implements in Government, Wards' and Private Estates.

32. During the year under report two iron sugarcane mills and three evaporating pans were distributed through the Agency of this Department. A list of the new or improved implements that have been tried in Bengal during the year is given in Appendix I.

Supply of Seeds, Manures and Implements.

33. A list of the principal seeds, implements, manures, etc., distributed by the department during the year under report (exclusive of those used in experimental farms) is given in Appendix II.

This work occupies a great deal of the time of the Travelling Overseers. There is a growing demand for sugarcane cuttings from the Burdwan Farm.

Crop-cutting experiments by District Officers and Settlement Officers.

34. The results of the crop-cutting experiments carried out in the districts of these provinces during the year 1900-1901 have been received and compiled in my office. The returns for the year 1901-1902 are now coming in. I shall fully analyse and discuss the results of these experiments when submitting the quinquennial report due next year.

Locusts and other Insect-pests.

(*1*) *Locusts.*

35. In the last year's report of this Department Mr. Lyon, noticed the appearance of locusts in many parts of this province in June 1901. Detailed information from the local officers tends to show that they did only slight damage to the standing crops in the tracts over which they passed, except in the districts of Champaran, Muzaffarpur, Darbhanga and in the Beguserai Subdivision of the district of Monghyr, where considerable injury is reported to have been done to the indigo and other standing crops. The Dacca and Chittagong Divisions alone escaped their visit.

(*2*) *Other Insect-pests.*

36. Referring to the appointment of a Government Entomologist last year, Mr. Lyon observed in the last Annual Report of the Department that it was hoped that considerable progress would be made during the past twelve months in the identification of the insects injurious to crops in this Province. Unfortunately Mr. De Niceville, the Entomologist, died suddenly in December last and no successor was appointed during the year. In spite of the circular of February 1901 in which Mr. Lyon issued instructions to the local officers to send specimens of all insects, caterpillars, &c., to the Entomologist direct, properly preserved in spirit, in many cases their appearance was either not reported at all, or the specimens were sent in in such a condition as to render their identification impossible.

During the past year the province did not suffer greatly from insect-pests.

The grasshopper, *Hieroglypus furcifer*, locally known as "Jhitika" again did some damage in the district of Puri and the common rice *hispa* did slight injury in a small area in the district of Chittagong.

A kind of caterpillar identified by the Entomologist as *Heliothis armigera* Hub, did considerable damage to the crops in Bihar, in the district of Palamau and also in the Nator Subdivision of the district of Rajshahi and in the Jhenidah Subdivision of Jessore.

Scirpophaga auriflua Zeller, was the identification given by the Entomologist of a caterpillar that caused some injury to the sugarcane crop in Rangpur and Champaran. A kind of insect locally known as *Gozra*, which is said to be very destructive of sugarcane, appeared in the district of Rangpur. Specimens of these insects were sent to the Entomologist, who identified them as allied to *Ligyrus rugiceps* Leconte, but they were new to the collection in the Indian Museum. A kind of insect, which was damaging the paddy crop in the Burdwan Experimental Farm was identified by the Entomologist as *Leptocorisa acuta* Thumb. An insect which was identified by the Entomologist, as *scutillera nobilis* Fabricius, family *scutellendal*, order *Hemiptera*, injured the grape vine in the Sripur Farm. Mr. N. N. Banerjei, Superintendent of the Sripur Farm identified the grasshopper *chrotogonus sanssurii* Bolio attacking *arhar* crop in the neighbourhood of and in the Sripur Farm.

A serious outbreak of potato blight occurred in thana Singur in the Serampore Subdivision of the Hooghly district. The damage was ascribed by Dr. Butler, Cryptogamic Botanist to the Government of India, to *Phytopthora infestans*. Dr. Butler suggested, as remedial measures, spraying with Bordeaux mixture, the use of untainted seed next year, and the burning of all debris when the crop is dug up. Two Eclair vaporizers have been ordered for spraying, and Dr. Butler's advice was transmitted to the Collector of Hooghly who has caused it to be printed and published to the cultivators of Singur and other thanas. It seems probable, however, that the disease will spread throughout the district unless the cultivators can be induced to rotate other crops with

potato. The Travelling Overseer, Babu Nibaran Chandra Chaudhuri, who made careful enquiry on the spot, ascribes the virulence of the outbreak to the extensive use of exotic hill potatoes, to excessive irrigation, and to cultivation of the same lands year after year with potatoes.

Sericulture.

37. The work done by the Bengal Silk Committee, with the assistance of Government, in rehabilitating the silk-rearing industry by teaching the rearers how to eradicate disease, continued to prosper. Improvement has been effected in Bogra and Murshidabad, and prospects in Rajshahi are hopeful. The Committee's Superintendent, Babu A. K. Ghosh, is now employed more on inspection than in detailed instruction of rearers, and the result has been successful. Model rearing houses have been completed or are in course of erection, and in order to enable the Committee to extend their work in this direction the Government grant of Rs. 3,000 has been doubled.

38. Work was started in Bogra only in March 1901, but with the assistance of the District Board, who have appointed an Overseer and two Sub-Overseers to instruct the rearers, good progress has been made, and the mulberry cultivation has increased.

39. In Malda the improvement has been maintained, and this district is still a long way ahead of other silk districts in the number of intelligent rearers, who have learnt modern ideas. Many old rearing houses have been ventilated while new houses are being built on approved lines. The Collector, who takes a keen interest in the work of the Committee, reports that mulberry is extending all over the district, especially in Gour. A Sub-Overseer has been appointed in the Government khas mahals.

40. In Murshidabad the Chandanpur nursery, which is the best of its kind, has continued to distribute selected seed in large quantities to the rearers. This nursery, after defraying the cost of unprofitable experiments, earned a profit of Rs. 195. A new nursery is being built at Rajdharpur, on a Government Estate, and the use of examined seed is spreading in the Government Estates west of the Bhagirathi. A new nursery is being built at Kumarpur, Mr. P. E. Gourju paying half the cost. At Jumua, near Kandi, the Raja has purchased a microscope, and a Sub-Overseer has been deputed there at his request.

41. Operations commenced in the Trans-Boral portion of Rajshahi in 1900, and in August 1901, they were extended to the whole of the district. Four Sub-Overseers have been appointed, and the results obtained are promising.

42. In Birbhum results have been disappointing. The Committee are investigating the causes of failure. The new nursery at Rammati is approaching completion, and it is hoped that large quantities of examined seed will be distributed from this centre.

43. A nursery in the Nadia district in the neighbourhood of Plassey, is to be built at the suggestion and expense of Mr. J. A. Anderson, for the purpose of carrying out scientific experiments in sericulture under the supervision of Mr. R. Malcolm.

44. The Committee are planning some interesting experiments with ruby and ultra-violet coloured glasses. Ruby colour is beneficial to insect-life, and it is expected that worms grown in a ruby light will grow to a large size. On the other hand it is said that microbes cannot exist under ultra-violet rays.

45. Experiments were also tried with worms grown from European seed, which was given by Mr. J. A. Anderson of Messrs. Anderson, Wright, & Co. Moderate success was achieved, but the Committee have decided not to continue these experiments. They are more hopeful of the results to be obtained by using hybrid seed, bred from the male European, and the female Indian moth. The hybrid seed is multivoltine. Some very fine cocoons have been produced from hybrid worms in the Chandpur nursery.

46. The Committee expended Rs. 14,825 or more than double the last year's expenditure, while they carried forward a balance of Rs. 666. Their income of Rs. 15,511 included a balance of Rs. 4,201 brought forward from last year.

47. The Rajshahi Diamond Jubilee Industrial School is being remodelled on a more popular basis. A demonstration class has been opened for illiterate

sons of rearers; the course to last six months. An area of eight bighas of mulberry land has recently been taken up and will supply a long-felt want. Experiments were made with the fly-shuttle loom to test its use in weaving silk, and with several indigenous and imported dyes, but the School Committee have wisely decided to confine their attention at present to improvement in the rearing of cocoons.

CHAPTER IV.

AGRICULTURAL EDUCATION.

Agricultural Class at Sibpur.

48. The two years' course of the agricultural class came into operation in November last, and instead of a higher and a lower class, there is at present a first and second-years' class. The number of students in both classes is only six. The falling-off of the attendance may be partly due to the introduction of the two years' course. Twelve students of the higher agricultural class and six of the now defunct lower class, appeared in the final examination during the year under report. Ten out of twelve of the higher class and all the lower class students passed. All the passed students of the first batch and the majority of those of the second batch have obtained appointments. Two of the 17 passed students of the higher agricultural class have been appointed Deputy Collectors and six Sub-Deputy Collectors. Only one higher class and three lower class students have not yet obtained employment.

Two lower class students have been appointed Overseers of the Sibpur and Chittagong Farms and have been enrolled as 2nd grade kanungoes in their respective Divisions. Two higher class students are employed as teachers of Agriculture and Science at the Dacca and Hooghly Training Schools. Passed students have also been employed by the Hon'ble Maharaja Manindra Chandra Nandy of Cossimbazar, the Nawab Bahadur of Murshidabad, the Maharaja of Mourbhanj, Kumar Brojendra Kishor Roy Chowdhuri of Gouripur, and the Hon'ble Modhu Sudan Das of Cuttack. The employment of these students by private land-owners is of very hopeful augury.

The Bengal Veterinary College.

49. A separate report on the working of the Veterinary College during the year 1901-1902 will be submitted in due course to Government. The result of the examination for graduates' diplomas was successful, nine out of eleven students obtaining diplomas.

CHAPTER V.

PUBLICATION OF AGRICULTURAL INFORMATION.

50. The monograph on "The Silk Industry of Bengal" which was written in 1899-1900, by Mr. N. G. Mukherji, Agricultural Lecturer, Sibpur Civil Engineering College, has not yet been published. The plates required to illustrate it have not yet been received from England. A monograph on "Ivory-carving in Bengal," by Mr. G. C. Dutt, Assistant to the Director of Land Records and Agriculture, Bengal, was published during the year.

51. The usual preliminary forecasts and final reports were published with reference to eight of the principal crops grown in the Province, as well as a general report on the outturn of the *rabi* crops of the previous season. The Agricultural Statistics of the previous year and the Statistics of Minerals and Gems were also compiled and published in the sanctioned form, and the prescribed consolidated table showing the average prices of food-grains, etc., in Bengal, during the year 1900-1901, was prepared and issued. The schedule of normal rates of prices of food-grains in Bengal for the five years ending 31st December 1900 was also prepared and published.

CHAPTER VI.

FINAL.

Emigration to Burma.

52. There has been considerable development during the past two years in the emigration of families from South Bihar to Burma, the number of

emigrants during the last three years being, in 1899-1900, 570, in 1900-1901, 843, and in 1901-1902, 1,540.

This expansion is satisfactory as showing that the emigrants are satisfied with the treatment received by them in Burma upon Mr. Mylne's grant. An industrious family can pay off advances, which are made without interest, in two years, and a registered lease is then given free of rent for three years and conveying a right of occupancy. More than half the emigrants are *Koeris* and *Kurmis*, the best cultivators in Bihar.

The emigrants are carried to Burma at reduced rates by the British India Steam Navigation Co., and one-third of the passage money is shared by the Governments of Bengal and Burma.

Agricultural Exhibition.

53. The following Agricultural Exhibitions and Cattle Fairs were held during the year under report, and grants of funds were made to some of them out of the allotment sanctioned by Government for that purpose.

Name of place where exhibition or fair was held.		District.		Government Grant.
(1) Kalimpong	...	Darjeeling	...	500
(2) Alipur	...	Jalpaiguri	...	200
(3) Falakata	...	Do.	...	300
(4) Khagra	...	Purnea	...	Nil.
(5) Rukindipur	...	Bogra	...	200
(6) Suri	...	Birbhum	...	150
(7) Sitamarhi	...	Muzaffarpur	...	100
(8) Berapur	...	Shahabad	...	150
(9) Tintanga	...	Bhagalpur	...	Nil.
(10) Sonepur	...	Saran	...	200
(11) Cuttack	...	Cuttack	...	100
(12) Tangail	...	Mymensingh	...	Nil

The exhibition of flowers and Agricultural produce which is annually held at Madhupur, in the Sonthal Parganas, was postponed last year owing to an outbreak of plague at that place.

A brief account of each of the exhibitions and fairs referred to above is given below.

54. *The Kalimpong Exhibition and Fair*.—This Fair, the main object of which is to encourage cattle and mule-breeding in Sikkim and Thibet, was held on the 27th and 28th November 1901. I was present at the *mêla* but unfortunately Veterinary-Major Raymond could not attend as the dates clashed with those of the Sonepur Fair.

The fair was successful in spite of unfavourable weather. There were good exhibits of agricultural produce, the maize in particular being excellent. A collection of local forest products was shown by the Deputy Conservator of Forests. The process of spinning by fly-shuttle loom was also exhibited. Rupees 556 was distributed as prizes to the Agricultural and Industrial sections of the exhibition. The number of entries in the cattle section of the last *mêla* was 103, consisting of Siri cattle 27, Nepali 32, cross-bred cattle 16, mythun 13, yak 9, and buffaloes 6. The animals exhibited were generally in good condition and amongst them were useful specimens of the various breeds. The number of prizes awarded for cattle was 44, amounting to Rs. 297. More ponies were exhibited in all classes than in the preceding *mêla*, but the quality was poor.

Sixty-eight mules competed for 19 prizes. They were a far more level lot than at last year's *mêla*. Rupees 500 of the special grant made by the Imperial Government for the encouragement of cattle-breeding was offered, but only Rs. 200 was awarded, as the grant was made too late to be properly advertised.

55. *The Alipur and Falakata Fairs*.—These two small fairs are kept up for political reasons with a view to encourage trade between Bhutan and the plains.

Both fairs lasted a month the Alipur fair opening on the 15th March 1902 and the Falakata fair on the 13th February. The average daily attendance in the former was 100, and in the latter some 300 persons. The value of articles sold at Alipur is estimated at Rs. 4,000 and at Falakata at Rs. 27,000. Government granted Rs. 200 to Alipur and Rs. 300 to Falakata,

and the grants were expended in sanitary arrangements, in the erection of temporary huts and in providing amusements. The Alipur fair is rapidly declining in popularity; and the Deputy Commissioner of Jalpaiguri and the Commissioner of the Rajshahi Division propose to transfer it to Satrabari where it could be held in January when the Bhutan envoy comes to Buxa. The Falakata Fair was more successful than usual.

56. *The Khagra Mela.*—This fair is growing into importance year by year under the management of Mr. Rolt, the Manager of the Khagra Ward's estate. This year's *mela* was held at Kissenganj from the 14th January to the 10th February 1902, and was the largest on record. The sanitary and police arrangements were excellent and there was no disturbance or out-break of disease. One hundred and fifty elephants, 1,100 camels, 4,000 buffaloes, 5,000 horses and ponies, 400 rams and 37,000 bullocks were brought in; of these 40 elephants, 400 camels, 1,800 buffaloes, 9,000 bullocks, 2,500 horses and ponies, and 200 rams changed hands during the fair. The cattle were chiefly from Sitamarhi, Muzaffarpur and Chapra. There were no local bulls and the few local cows were in poor condition. The ponies were a fair lot and some of the camels were very good. It is understood that the camels are sold for sacrificial purposes. The receipts of the estate from the fair amounted to Rs. 10,432-3-3 being an increase of Rs. 2,319-13-3 over the previous year's receipts. A sum of Rs. 2,896-15-3 was spent in advertising the fair, in providing amusements, and in the improvements of the *mela* ground. I have suggested to the Manager that out of the profits of the *mela* some prizes may advantageously be awarded for agricultural stock and produce.

57. *The Rukindipur Show.*—The Rukindipur Agricultural Exhibition was held on the 20th January 1902 in the Jaipur Government estate, in the district of Bogra. The number of exhibits admitted was fewer than last year but of better quality. The exhibits were agricultural products, and manufactured articles. The Government contribution to the show was Rs. 200 and Rs. 266 was distributed in 73 prizes.

58. *The Suri Cattle and Produce Show.*—This fair was held for 12 days from the 30th January 1902. The Divisional Commissioner opened the Show and Mr. Lyon, Veterinary Major Raymond, the Maharaja of Cossimbazar and the Raja of Nasipur were present.

The Show was a great success, owing to the exertions of Mr. Ahmad, the Collector of Birbhum. The exhibits included 301 head of cattle, 49 sheep, and 83 goats, besides various agricultural products, silk and other local manufactures. Babu A. K. Ghose, the Sericultural Superintendent employed by the Bengal Silk Committee, attended with two overseers and showed the different stages of the growth of silk worms and their diseases, and how to cure them. Two Hissar bulls (one at Suri and the other at Rampur Hat) are maintained by the Exhibition Committee for breeding purposes. Rupees 150 was contributed by Government in aid of this Show and Rs. 500 was offered from the grant by the Imperial Government for awarding special prizes to the exhibitors of the best cattle of the local breed. But as cattle of pure local breed are of a very inferior quality, Rs. 188 only was awarded from the Imperial grant. Rupees 3,661 were raised by local subscriptions for the cost of the exhibition, and the disbursements amounted to Rs. 2,953 only. A dairy has been started in connection with this exhibition and the Lieutenant-Governor, during his recent tour in the district, granted Rs. 500 in aid of it.

59. *The Sitamarhi Fair in Muzaffarpur.*—This annual fair was held this year on the 17th April. Mr. Burke, Assistant Superintendent, Civil Veterinary Department, attended the exhibition and helped to judge the animals brought in for competition. Seven bulls, 16 bull-calves, 35 cows and 70 pairs of bullocks competed for prizes. It is noticeable that all the bulls exhibited belonged to the European planters of the district. They were in good condition and five of them were awarded prizes. Several of the bull-calves shown were by the Hissar bull which died some months ago at Sitamarhi. The cows were of indifferent quality; most of the bullocks exhibited were of the Koilpur and Bachour breeds and were good. Some good buffaloes were exhibited. The Government contribution in aid of this Fair was Rs. 100; Rs. 145 from local funds and Rs. 490 and a silver medal from the Imperial grant were given away in prizes to the exhibitors of the best cattle. This fair is losing popularity.

60. *The Barahpur Show*—The Barahpur Cattle and Agricultural Show, the object of which is to promote agriculture and cattle-breeding in the district, was held this year on the 7th and 8th March last. Veterinary Major Raymond attended the Fair and helped in judging the horses and cattle. The attendance was small owing to the plague scare. The cattle were below the average in quality, although a fair number of good bullocks of imported breeds were shown. The horses and ponies were few and of miserable quality. Rupees 150 was granted by Government in aid of this year's exhibition, and Rs. 500 was offered by the Imperial Government for special prizes to the local breed of cattle at this Show. But the cattle exhibited were poor of such quality that only Rs. 150 was awarded.

Various kinds of agricultural products, garden-produce and articles of local manufacture were exhibited. My Assistant Director, Mr. D. N. Mookerji, visited the exhibition and helped in arranging and judging the agricultural exhibits. Rupees 244 was awarded to the exhibitors of agricultural products. Local subscriptions in aid of this exhibition have decreased, and the cost of the exhibition now falls almost entirely on Government and the District Board.

61. *The Tintanga Agricultural Show.*—This year's Show was held on the 22nd February last and the two following days, when Mr. D. N. Mookerji Assistant Director, Land Records and Agriculture, visited the Fair and assisted at the distribution of prizes. He explained to the assembled raiyats the principle or green manuring, his remarks arousing much interest

The funds of the exhibition this year, including the Government contribution of Rs. 100, amounted to Rs. 255-15, and Rs. 199-14 was spent in prizes and in sports and amusements.

62. *Sonepur Horse and Cattle Fair.*—This Fair was held from 16th November to 2nd December 1901. Veterinary Major Raymond who visited the Fair estimates the number of animals at 400 horses, 1,800—2,000 ponies, 250 cows, 25,000 bullocks, 500 elephants and 20 camels, besides buffaloes and goats. The quality of the exhibits as a whole was poor except the buffaloes, which were good. A sum of Rs. 410 was distributed in prizes, of which Rs 200 was contributed by Government and the balance by the District Board. Out of the Imperial grant of Rs. 500 to this Fair for special prizes to cattle, only Rs. 70 could be spent in prizes for country cows; no country bull worth a prize was shown.

63. *The Cuttack Agri-Horticultural and Industrial Exhibition.*—This exhibition, which is managed by a strong executive committee presided over by the Commissioner of the Division, is gradually growing in importance. This year's show was opened on the 7th February last and attracted a record number of visitors. The exhibits have improved both in quantity and quality. A fly-shuttle-loom was exhibited and was watched with great interest. The District Board has since set up a fly-shuttle-loom in the cutchery compound and is inviting weavers from the different weaving centres in the district to come to Cuttack to learn how to use it. Rupees 888-9 was raised by local subscription, and Government contributed Rs. 100. Rupees 583-4 was spent in awarding prizes to the different classes of exhibits. A sum of Rs. 1,517-11-9, now stands to the credit of the exhibition committee as the balance of previous shows.

64. *Tangail Exhibition.*—An exhibition of agricultural and industrial products was started this year at Tangail in the district of Mymensingh with the object of introducing improved methods of cultivation, and the use of superior implements, and was a great success. The exhibits included various kinds of paddy, vegetables, fruits and flowers, and cotton and silk fabrics, all of local production. Specimens of bell-metal work, cane work, ivory work, and furniture locally made, were also shown. There were also two fly-shuttle-looms, one of which was worked in the presence of a crowd of weavers who followed the operation with close interest. Besides these local exhibits, a large number came from Gauhati Surat, Dacca and Calcutta. Rupees 2,025 was subscribed and 16 silver medals were presented by the zamindars and others. Altogether 3 gold and 23 silver medals, besides money prizes, were awarded to the successful exhibitors.

Provincial Museums.

65. There is only one small Museum in addition to the Museum in Calcutta, which is not treated of in this report. This Museum was established

at Dumraon, by the late Maharaja in commemoration of the Jubilee of Her late Majesty the Queen-Empress, in 1887. No addition was made during the year to the collections, but some damaged specimens of grains were replaced. The Museum is located in a spacious building in the heart of the town, and is under the supervision of the Overseer of the Dumraon Experimental Farm. My predecessor, Mr. P. C. Lyon, and the Assistant Director, Mr. D. N. Mookerji, inspected the Museum.

Applications for Patents for Inventions.

66. Fourteen applications for patents of an agricultural and commercial character were received from the Government of India for opinion during the year under report. Five of these applications were for improvements of indigo; while the remainder were in connection with the extraction and treatment of fibres, manufacture of tea, improvements in flour mills, paddy boiling and drying, ground-nut husking and bale ties or fasteners. The opinions of experts on these patents was obtained by this Department and forwarded to the Patents Branch of the Revenue and Agricultural Department of the Government of India.

Cost of Miscellaneous Experiments and Enquiries.

67. The cost to Government of agricultural experiments and miscellaneous enquiries conducted under the direct supervision of the Department of Land Records and Agriculture during the year under report amounted to Rs. 4,696-13-8 against Rs. 5,379-4-3 expended in the preceeding year. The details of the expenditure will be found in Appendix III.

Officers of the Department.

68. Babu Girish Chander Dutt, my Personal Assistant, on Agricultural side has done good work in the office.

I acknowledge with gratitude the advice and help received from Major Prain, I.M.S., Superintendent of the Royal Botanic Gardens at Sibpur, Dr. Watt, C.I.E., Reporter on Economic Products to the Government of India, and Dr. J. Walter, Leather, Agricultural Chemist to the Government of India.

I have the honour to be,

SIR,

Your most obedient servant,

C. G. H. ALLEN,

Offg. Director of the Dept. of Land Records and Agriculture, Bengal.

APPENDICES.

A list of Agricultural Implements and Machines which have been tested in Bengal during more or less

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.
1	2	3	4	5	6
1	Behia Sugarcane mill	Crushing sugarcane.	The juce can be extracted from the cane in a shorter time, and with less labour and expense, than by means of the ordinary wooden mills.	Rs. 68 to Rs. 135, according to size and kind of the machine.	Messrs. Thomson and Mylne of Behia, Shahabad.
2	Sugarcane pressing mill.	Ditto	Cheaper than the Behia mills.	Rs. 30 to Rs. 55 ...	Narsiganj Turbene ...
3	Four-roller mill ...	Ditto	Gives 7 per cent. juice more than the ordinary mills.	Rs. 160	Mr. C. R. Simpson, Mullickpore (United Provinces of Agra and Oudh.)
4	Three-roller cane-crusher.	Ditto	Gives 20 per cent. juice more than the ordinary mills. Worked by steam power.	Rs. 1,500	Messrs. Jessop & Co., Calcutta.
5	Shallow evaporating pan.	Boiling sugarcane juice.	Yields best and highest outturn.	Rs. 30	Messrs. Thomson and Mylne of Behia, Shahabad.
6	Sibpur plough ...	Tilling lands, soil inverting.	Being made of wrought-iron, can be easily repaired. A Comparatively cheap soil-inverting plough.	Rs. 7 to Rs. 8 ...	Sibpur Experimental Farm, Sibpur.
7	Indian plough ...	For tilling the ground.	Simple and cheap. Cast-iron tipped, and therefore lasting.	Rs. 7-8	Messrs. Burn & Co., Howrah Iron Works.
8	Howard's plough ...	For ploughing ...	Deep ploughing and inversion of soil.	Rs. 60	Messrs. W. Leslie & Co., Calcutta.
9	Indigo-cultivator	Used as a bullock hoe and cultivator.	Simple in construction and cheap.	Rs. 8	Tikari Manager's Workshop, Gaya.
10	Planet Jr.'s hand hoe (American).	Lightly stirring up soil.	.....	Rs. 20	Messrs. T. E. Thomson & Co., Calcutta.
11	Indigo-raker ...	For collecting weeds and leveling lands.	Better than ordinary harrow	Rs. 8	Tikari Manager's Workshop, Gaya.
12	Iron *done*	For lifting water from shallow depth.	Lighter and more durable than the wooden *done*.	Rs. 8	Rampur hat, Birbhum ...
13	Swing basket ...	Ditto ...	.....	Re. 1	Local bazar of Dumraon, Shahabad.
14	Reaping-machine ...	Reaping oat and wheat.	.....	About Rs. 400 ...	Bombay Agents ... ...
15	Tar (seed drill) ...	Sowing rabi seeds	Seeds are placed at equal depth.	Rs. 2	Local Bazar of Dumraon, Shahabad.
16	Chaff-cutter (hand power.)	Cutting fodder into slices.	Cuts fodder at the rate of 2 maunds per hour.	Rs. 150	Messrs. Thomson & Co., Calcutta.
17	Steel yard	Weighing	Weighs up to 50 pounds ...	Rs. 10	Agricultural Department, United Provinces of Agra and Oudh, Cawnpur.

DIX I.

the year ending 31st March 1902 and of those in use which are reported to have met with marked success.

Name and designation of the reporting officer.	Opinion.	Extent to which used by native agriculturists.	Remarks.
7	8	9	10
Commissioners of Chittagong, Patna, and Orissa.	An efficient machine for extracting juice from sugarcane. Its use is still very limited on account of its high price.	Five hundred and forty-one mills sold by Messrs. Thomson and Mylne.	
Commissioner of Patna	.....	Used to a very small extent in Sasaram subdivision.	
Ditto	.....	.....	
Ditto	.....	.....	
Commissioners of Chittagong, Patna, and Orissa.	Proved satisfactory.	Six pans sold by Messrs. Thomson and Mylne during the year.	
Commissioners of Patna, Bhagalpur, and Orissa.	In Monghyr the result of trial was successful, but it is too heavy for the ordinary bullocks of the district.	.....	
.....	.....	Six sold.	
.....	A satisfactory plough, but too heavy and expensive for general use.	.....	
.....	.....	.....	
Commissioner of Patna	The work is done in less expenditure than by spade.	Not used by the native cultivators.	
.....	.....	.....	
Commissioner of Patna	.....	Extensively used by the native cultivators of West Bengal.	
Ditto	.....	Used by all the cultivaters.	
Ditto	Works very satisfactorily.	.....	
Ditto	.....	Used by all the cultivators.	
Ditto	.....	Not used by the native cultivators.	
Ditto	Useful	Ditto ditto.	

APPENDIX II.

List of seeds and manures distributed by the Department during the year 1901-1902.

	Seeds.	Mds.	s.	ch.
1.	Potato	635	0	0
2.	Sonamung	5	20	0
3.	Wheat	37	0	0
4.	Barley	1	5	0
5.	Oat	32	0	0
6.	Gram	25	35	0
7.	Peas	1	10	0
8.	Patal root	2	1	0
9.	Paddy	10	0	0
10.	Sugarcane	about 380 kahans (1 kahan=1280 cuttings).		

Also jute, onion, maize, sunnhemp, *arhar*, guinea grass, cotton, chilly, *musur*, *jeera*, mustard, ground-nut and other seeds.

	Manures.	Mds.	s.	ch.
Bonemeal	... ...	59	0	0
Castor cake	... ...	90	0	0
Saltpetre	... ...	2	35	0

APPENDIX III.

Expenditure on Miscellaneous Experiments and Enquiries made by the Department.

		Rs.	A.	P.	Rs.	A.	P.
(1)	Experiments other than those made in experimental farms ...				1,530	0	9
	(*a*) Cost of potato cultivation in Darjeeling ...	300	0	0			
	(*b*) Purchase of seed potatoes	644	3	0			
	(*c*) Ditto of other seeds and manures ...	172	6	3			
	(*d*) Miscellaneous	413	7	6			
		1,530	0	9			
(2)	Pay and travelling allowance of the Agricultural Overseers ...				1,144	13	2
(3)	Purchase, &c., of implements				107	4	0
(4)	Cost of illustrations for the Monograph on Ivory Carvings ...				508	10	0
(5)	Do. of lithographing, lettering, and printing plates for Captain A. T. Gage's Notes on Sugarcane Disease				19	0	0
(6)	Miscellaneous, including Rs. 448-12 for pay and travelling allowance of the Head-master, Rampur Boalia Diamond Jubilee Industrial School, and Rs. 482-7 for importation of Australian Cattle from Brisbane				1,387	1	9
	Total ...				4,696	13	8

B. S. Press—7887J—475—30-6-1902—A. W. W. & C. A. P.

REVENUE DEPARTMENT.

AGRICULTURE.

DARJEELING, THE 5TH SEPTEMBER 1902.

RESOLUTION—No. 1755T.R.

READ—

The Report of the Agricultural Branch of the Department of Land Records and Agriculture for the year 1901-1902.

Letter No. 678A., dated 30th July 1902, from the Board of Revenue, submitting the report with their remarks.

Read again—

Resolution on the same report for 1900-1901.

IN accordance with suggestions approved by the Government of India, the present report on the Agricultural Branch of the Department of Land Records and Agriculture does not notice work done in connection with maintenance of land records: this topic will in future be dealt with in the Director's Settlement Report.

The Director, Mr. P. C. Lyon, and the Officiating Director, Mr. C. G. H. Allen, who succeeded Mr. Lyon on the 4th November 1901, spent altogether 160 days on tour, in the year under report, in connection with settlements, land records and agricultural work, and made useful inspections.

2. *Scientific Enquiries.*—Of the agricultural enquiries made during the year the most important are those as to the effect of the imposition of the countervailing duties on the prospects of the sugar-refining industry, and as to the alleged deterioration of jute. Under the last-named head, experiments are being conducted with selected jute seed at the Burdwan and Chittagong farms, on lines suggested by the Reporter on Economic Products. On both subjects special reports will be awaited.

3. *Experimental Farms and Experiments in Government Estates and Wards' Estates.*—Experiments with manures were continued at the Burdwan and Dumraon Farms, and it is claimed that the experiments conducted at Burdwan show that a high rate of profit is to be got by applying carefully selected manures to rice, sugarcane and potatoes and especially by green manuring. The Burdwan Farm and the Sripur Farm in the Hathwa Estate were well managed, but the Dumraon Farm not so well during the year. The Inspector-General of Agriculture has advised with regard to the future management of the last-named Farm. The Chittagong farm has continued to attract much local interest. The question of establishment of an Experimental Farm at Pusa, to which reference was made in last year's Resolution, is still unsettled.

The Director again urges the necessity for a closer supervision of the money expended on agricultural experiments in Government Estates and Wards' estates and proposes to increase the number of travelling overseers. Mr. Lyon stated in his Report for the year 1900-1901, that a travelling overseer had been appointed for the district of Backergunge to visit the various estates managed by the Collector and to advise generally in matters connected with agricultural improvement. On this it was ordered that the results obtained by this appointment in Backergunge should be reported. The Director has not, however, mentioned the result of the experiment in the Backergunge district; and it will be best that he should deal with the matter in a separate report.

It is understood that the Board will favour Government with their views on the expediency or otherwise of creating central agencies or farms in the case of Wards' estates.

4. *The Sibpur Agricultural class.*—The success of the Sibpur Agricultural students in obtaining employment both in Government service and under private landowners, which is noticed in paragraph 48 of the Report, is very satisfactory.

5. *Sericulture.*—The efforts of the Bengal Silk Committee to assist production of healthy silk-worms were attended, except in the district of Birbhum, with successful results. Enquiry is being made into the causes of the failure of the operations in that district. To enable the Committee to further expand the scope of their operations and to meet additional expenditure in connection with the erection of new model nurseries in the centres of important silk districts, the annual grant of Rs. 3,000, hitherto made by Government, was raised to Rs. 6,000 for the year 1902-1903, with the prospect of its being continued at this increased rate for two years more.

The course of sericultural instruction imparted at the Rampur Boalia Industrial School was remodelled on a more popular basis, the main object of the school being the training of cocoon rearers' sons. In their case the course of training was reduced to six months, and no educational qualifications are required. The one-year rearers' class has been retained for educated students to be trained for the posts of sub-overseers and inspectors in the villages. To encourage the training of rearers' sons in the elementary course, the majority of the District Board scholarships are to be assigned to them.

6. The many heads of work indicated in the Director's Report sufficiently establish his claim for more expert assistance, and the Lieutenant-Governor expresses the hope that this may soon be sanctioned.

The Lieutenant-Governor thanks Mr. Lyon and Mr. Allen for their zeal in discharge of their duties, and also notices with pleasure the good work done by Mr. Nagendranath Banerji in the Sripur Farm.

By order of the Lieutenant-Governor of Bengal,

W. C. MACPHERSON,

Offg. Secretary to the Government of Bengal.

No. 2212T.—R.

COPY forwarded to the Secretary to the Board of Revenue, Land Revenue Department, for the information of the Board.

No. 2213T.—R.

COPY forwarded to the Director of the Department of Land Records and Agriculture, Bengal, for information, with special reference to paragraphs 2, 3, and 6.

No. 2214T.—R.

COPY, with a copy of the Report, forwarded to the Appointment Department of this office for information, with special reference to paragraph 6 of the Resolution.

By order of the Lieutenant-Governor of Bengal,

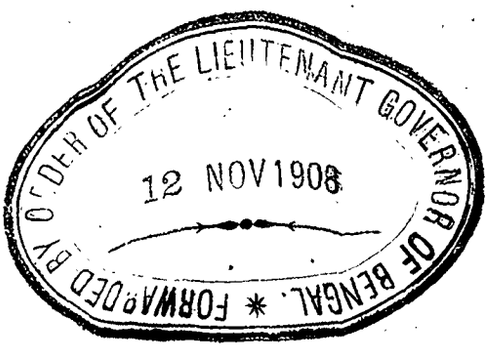
L. E. B. COBDEN-RAMSAY,

Under-Secy. to the Government of Bengal.

DARJEELING,
The 4th October 1902.

B. S. Press—2965C—635—8-10-1902—C. B & C. W.

REPORT



OF THE

AGRICULTURAL BRANCH

OF THE

DEPARTMENT OF LAND RECORDS AND AGRICULTURE,

BENGAL,

For the year ending 31st March 1903.

Calcutta:

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[Maximum limit, 20 pages.]

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DEPARTMENT OF LAND RECORDS AND AGRICULTURE, BENGAL.

No. 1385A.

FROM S. L. MADDOX, ESQ., I.C.S.,

Offg. Director of Land Records and Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE, L. P.,

Dated Calcutta, the 15th June 1903.

SIR,

I HAVE the honour to submit the report of the Department of Land Records and Agriculture, Bengal, for the year ending on the 31st March 1903. This is the eighteenth annual report, and has been prepared in accordance with the orders contained in letter No. 92-298—5, dated the 20th January 1902, from the Government of India, Revenue and Agriculture Department, copy of which was forwarded to this office with the Board's letter No. 47A., dated the 6th February 1902.

CHAPTER I.

PREFATORY.

2. Mr. C. G. H. Allen, I.C.S., was in charge of the Department up to the 28th February 1903, when I took over from him. Mr. Allen twice inspected the Sripur and Dumraon Farms, the Sericultural school at Rampur Boalia, and the Sericultural operations of the Bengal Silk Committee at Berhampur. He also inspected the Veterinary Dispensaries at Comilla and Barisal, and the agricultural researches carried on at Dalsingserai and Peepra, and the Veterinary Dispensary at Bankipur. He visited Pusa in company with Mr. Mollison, Inspector-General of Agriculture, Veterinary Lieutenant-Colonel Morgan and Veterinary-Major Raymond, in connection with the scheme for establishing an agricultural research station there. Mr. Allen also visited the Burdwan Farm in company with Mr. Mollison, and the Veterinary Dispensary at Laheria Serai. In March last, I visited Sibpur Farm with Mr. Mollison and Mr. F. G. Sly, Director of Agriculture, Central Provinces. During the last financial year Mr. Allen was on tour for 181 days, including 38 days spent with the Irrigation Commission, and I was on tour for 21 days. Mr. Byrne, who was appointed as special officer in this Department during Mr. Allen's deputation as a member of the Irrigation Commission, attended the Sonepur fair in November last.

Mr. Debendra Nath Mookerji was Assistant Director, and Babu Girish Chandra Dutt, Personal Assistant on the Agricultural side, throughout the year.

In this report no mention is made of subjects discussed in previous reports with regard to which no action has been taken during the year to which it relates.

CHAPTER II.

SCIENTIFIC AND NATIONAL ENQUIRY UNDER IMPERIAL CONTROL.

Sola (Æschynomene).

3. A review of the existing information about the sola-pith plant by Sir George Watt, M.B., C.M., F.L.S., K.C.I.E., has been published in Agricultural Ledger No. 6 of 1902.

Prospects of the Indian Sugar Industry.

4. In accordance with the Government Order No. 3765, dated the 3rd December 1901, calling for a further report on this subject, Mr. C. G. H. Allen reported, in December 1902, that the District Officers were unanimous in reporting that the recent legislation had no effect in checking the import of foreign sugars. He also reported that beet sugar was cheaper and better refined than native-refined sugar, and was therefore increasing in popularity at the expense of the latter, and that the prejudices against foreign sugars are disappearing. He himself was of opinion that the recent legislation had no effect in stimulating the indigenous cultivation of sugar, or in arresting the decay of the sugar refining industry in Bengal.

Sugarcane Disease.

5. In October 1902, Messrs. Cox and Company, Agents, India Development Company, Limited, reported the occurrence of Sugarcane disease, supposed to be "Sereh," at Seerhaha, in Tirhut. At the request of the Government of Bengal, Dr. E. J. Butler, M.B.,B.A., the Cryptogamic Botanist to the Government of India, visited the place and furnished the following report on the disease.

"This disease has been shown, partly from field examinations made by me at Seerhaha, partly as a result of cultures obtained from diseased canes sent to Dehra Dun from the same estate, to be due to the fungus known as *Colletotrichum falcatum* Went, and to have nothing in common with "Sereh." This fungus is said at Kew to be identical with the fungus which causes the well-known "rind disease" in the West Indies. The identity of the two fungi is denied by the Dutch Scientists in Java, and their view is supported by Mr. Barber, Government Botanist, Madras, who has seen both diseases, and by several other botanists. The thing to be borne in mind is that the Bihar disease is identical with the Java and South Indian disease called "Red smut" or "Red rot," and that the cause of it is *Colletotrichum falcatum.*"

He has also observed that in the present outbreak in Bihar, the fungus is clearly associated with the root-borer which should be identified first. With this view the district officer has been asked to furnish Dr. Butler with some specimens of the living grub, on earth. A full report on this subject will be submitted to Government in due course.

Alleged deterioration of Jute.

6. The enquiry started last year, at the instance of the Calcutta Jute Balers' Association, consisted of the following heads:—

(*a*) Comparison of varieties.
(*b*) Enquiry into the best stage for harvesting.
(*c*) Influence of thick and thin sowing.
(*d*) Effect of selection of seed.
(*e*) Influence of the character and temperature of the water for steeping.

The experiments were made at the Burdwan Experimental Farm, and some of them were duplicated at the Chittagong Farm where the crop failed. Chittagong is not a jute district however, and during the present year some of the experiments are being duplicated in Mymensingh, Jalpaiguri and Faridpur.

Fifteen different varieties of jute were grown at Burdwan. The seeds were found, when the plants came up, to be greatly mixed, illustrating the proverbial carelessness of the *raiyats* in the matter of seed selection. All plants not true to variety were removed. The bark and prepared fibre from a few plants of each variety were forwarded to the Agricultural Chemist for examination. Fibre was also produced in sufficient bulk for appraisement by experts nominated by the Jute Balers' Association. The fibre of some of the varieties was spoilt a little by oversteeping but the colour was almost invariably good. The experts pronounced emphatically in favour of the variety improved by some twelve years' selection on the farm itself.

Pure seeds of over forty different varieties were procured from all the most important jute districts for the present year's experiment. For this purpose pure healthy plants were selected in the fields by the travelling overseers of this Department and arrangements were made with the raiyats for seeds from those

plants only. These have been sown at Burdwan and in three of the most important jute districts as mentioned above. Mr. Burkill, the Officiating Reporter on Economic Products to the Government of India, has, at Mr. Mollison's request, kindly undertaken a botanical study of them.

The verdict of the experts chosen by the Jute Balers' Association on the effect of harvesting the plants at different stages was not very clear. But thin sowing gave an outturn of about 22 maunds of fibre against 17½ maunds obtained from thick sowing at the raiyats' rate.

The effect of last year's selection of seeds has been noticed above. Under the Inspector-General's orders a new system of selection has been started, for the result of which it will, however, be necessary to wait for a few years.

The temperature of the retting water was carefully kept from day to day, and the water was analysed by the Agricultural Chemist from time to time, but no results of any value have yet been obtained.

I addressed a letter to the Secretary, Jute Balers' Association, asking for more definite information regarding deterioration of the fibre and the localities in which it was prevalent. In reply the Acting Secretary says the reports of the experts resident in the jute growing districts are conflicting. The Committee, however, lay stress on the fact that the fibre is not generally properly dried by the raiyats, and what is worse, it is often deliberately watered by the middlemen to increase its weight. This excessive moisture affects the strength and colour of the fibre. The Committee, therefore, suggest legislation on the lines of the "Bombay Cotton Frauds Act, No. VII of 1878," penalising the sale of jute containing an undue proportion of moisture. I have been permitted by Government to submit proposals for the purpose but this permission does not, of course, bind Government to undertake the legislation suggested.

Dioscorea (yams).

7. The Officiating Reporter on Economic Products to the Government of India informs me that the investigations on the subject of yams (dioscorea) are expected to be published in an Agricultural Ledger next cold weather when the crop, now coming up, has been dealt with.

Enquiry regarding the supposed injurious effects of Well-Irrigation in certain Tracts in North Bihar.

8. The Assistant Director drew up a programme of experiments which were necessary to elucidate this question, but the Collector of Champaran expressed his inability to carry them out last year. Arrangements are being made to conduct the experiments this year, and with this view the Assistant Director has again visited Champaran.

Collection of Articles for the Indian Museum and the Imperial Institute, London.

9. During the year under report only a few specimens of economic products were collected by this Department through its Travelling Overseers for the Imperial Institute, London, and were forwarded to the Reporter on Ecomomic Products to the Government of India.

Bengal Veterinary Department—Cattle breeding.

10. The annual report of the Civil Veterinary Department, Bengal, will be separately submitted to Government. The Manager of the Hathwa Raj recently reported that the Ayrshire cattle (imported from Australia) sent to the Sripur Cattle Farm are now well acclimatized, and requested that they may be removed to Bankipur at an early date. The Superintendent, Civil Veterinary Department has, however, expressed his opinion against their removal from Sripur till December next. Arrangements are therefore being made in consultation with the Commissioner of Patna for their transfer to Bankipur in the coming cold weather.

As in the previous year a sum of Rs. 2,500 was specially sanctioned by the Government of India for the award of prizes at cattle fairs which was equally

distributed to the fairs at Sonepur, Kalimpong, Barahpur, Suri and Sitamarhi. The total sum actually awarded was only Rs. 1,281-10-6, as suitable animals did not compete for the balance of the money offered. Six silver medals were also awarded by the Inspector-General, Civil Veterinary Department, India, two at each of the fairs at Sonepur, Barahpur and Sitamarhi. The conditions of awarding these prizes have been approved by Government and are now being circulated by Veterinary-Major Raymond to the secretaries to the Fair Committees for the guidance of the judges.

CHAPTER III.

SCIENTIFIC AND LOCAL ENQUIRY UNDER PROVINCIAL DIRECTION.

Experimental and Demonstration Farms.

11. There are, strictly speaking, only two Research Farms, one at Burdwan and the other at Dumraon. The Sibpur Farm is maintained as a practical training ground for the agricultural students of the Sibpur College. The Sripur Cattle Farm contains about 32 acres of land devoted to experimental cultivation. The results of the experiments carried out in the Research Farms during the year are summarised below. The details of the experiments are given at length in the annual reports of those farms which are published separately.

Burdwan Experimental Farm.

12. *Area.*—31 acres, of which only 13 acres were under experimental cultivation.

Rainfall.—47·43 inches against a normal of 55 inches. The rainfall was well distributed.

I.—Manure experiments.—Samples of all the different manures used on the farm were submitted to the Agricultural Chemist for analysis. The quantity of each kind of manure used per acre was determined by the percentage of nitrogen in it as shown by the analysis.

Manure experiments were carried out with paddy, jute, sugarcane and potatoes.

(*a*) *Paddy*.—Three sets of manure experiments were tried with paddy. To avoid repetition, the results quoted below should in each case be understood as obtained per acre.

In the first series the mixture of bonemeal (3 maunds) and saltpetre (30 seers) again gave the highest outturn of grain (4,600 lbs.) against 1,466 lbs., the average of three unmanured plots. The net profit in the first case was Rs. 101 against Rs. 17 in the second case. Bonemeal alone also gave excellent results, 3 maunds of it giving an outturn of 3,800 lbs of grain and 6 maunds an outturn of 4,080 lbs. The net profit in the two cases amounted to Rs. 76 and Rs. 81, respectively.

In the second series of manure experiments with paddy (*scheme, 50 lbs. nitrogen per acre*), bonemeal (880 lbs.) and saltpetre (270 lbs.) gave an outturn of 3,352 lbs. of grain, and a net profit of Rs. 44 (average of three plots). Bonemeal alone (880 lbs. containing 20 lbs. of nitrogen per acre) gave an outturn of 3,888 lbs. and a net profit of Rs. 76. Analysis shows the soil of the farm to be deficient in phoshoric acid. This explains the excellent results obtained by the use of bonemeal as a manure. Saltpetre alone (670 lbs.) gave only 3,084 lbs. of grain. The manure cost no less than Rs. 42. It would be certainly much cheaper to buy crude saltpetre direct from the *nunias* of Bihar instead of in the Calcutta market, but the quantity that would yield the best result will have to be ascertained by further investigation. The present experiments would seem to indicate that a too large quantity of this manure does not give a correspondingly large outturn.

The third set of manure experiments with paddy (green manuring *versus* cowdung) gave important results. Since 1895-96 jute has been used for green manuring. During the year under report, another plot was added to the series,

in which *sunn* hemp (*Crotolaria juncea*) was sown and ploughed in. Unlike jute, *sunn* hemp belongs to the leguminous family, which alone, as modern investigation shows, has the power of as similating the free nitrogen of the atmosphere, the element so much required by the cereal crops. The following results were obtained:—

	Outturn of grain in lbs.	Net profit in Rs.
Jute ploughed in	3,077	57
Sunn hemp ploughed in	2,752	50
Cowdung, 50 mds.	2,435	42
No manure	1,680	26

It will be seen that jute did better than *sunn* hemp, but while jute was allowed to grow for about three months, *sunn* hemp grew only for half that time before it was ploughed in. However, both the *sunn* hemp and jute gave good results. The experiment also emphasises the great mechanical value of the accumulation of organic matter in any shape in the soil.

(*b*) *Jute.*—The manure experiment with jute did not tell on account of the unsuitability of the site.

(*c*) *Sugarcane.*—Serious damage was done to the crop by white ants and cane-borers.

(*d*) *Potatoes.*—The programme of experiments was changed during the year by the Inspector-General of Agriculture. Instead of having simply cowdung, castor cake and bonemeal, we now have in addition to these rape cake and mixtures of castor cake and saltpetre, rape cake and saltpetre, bonemeal and saltpetre. The scheme is to supply 100lbs. of nitrogen per acre in every case excepting bonemeal. The experiment was tried in duplicate with the Umbala potatoes planted at the rate of 1,800lbs. per acre. In each series castor cake alone (20 maunds) gave the highest outturn, *e.g.*, 19,062lbs. (average of two plots). The other manures also gave good results. It seems there is no distinct advantage in supplying the nitrogen in the form of a mixture of oil cakes and saltpetre instead of in the form of oil cakes alone, nor, owing to the high price of saltpetre, is the substitution economical.

The green manuring experiment with potatoes was again repeated with and without the addition of other manures. The plant chosen for green manuring was *dhaincha* (*Sesbania aculeata*). The results are noted below:—

	Outturn. Mds.	Net profit. Rs.
Green manured alone	150	16
Do. and cowdung, 272 maunds* ...	156	20
Do. „ castor cake 20 „ * ...	178	16
Do. „ bonemeal, 24½ „ * ...	164	2

* Containing 100lbs. as in the preceding scheme.

This was in confirmation of the results obtained in the previous year.

II.—Trials with Implements.—The Sibpur plough, which inverts the soil and goes deeper than the local plough, was tested with paddy and gave good results as follows:—

	Sibpur plough.		Local plough.	
	Grain. Lbs.	Profit. Rs.	Grain. Lbs.	Profit. Rs.
No manure	1,413	16	1,095	6
Bonemeal, 3 maunds	3,123	57	2,871	61
Saltpetre, 30 seers	2,900	71	2,532	52

III.—Experiments in Methods of Cultivation.—Various experiments were tried with paddy, sugarcane, potatoes, and jute.

(*a*) *Paddy.*—(*i*) Thick sowing at the rate of 60lbs. *versus* thin sowing at the rate of 30lbs. per acre. Both gave equal results, about 3,000lbs. of grain.

(*ii*) Ordinary way of transplantation *versus* transplanting 8″ apart. This was a new experiment. But it did not tell, as the deviation from the raiyats'

practice (9″ to 10″) was not sufficiently marked. It is proposed to vary the experiment during the current year by making the distance 6″ on the one hand and 12″ on the other.

(*iii*) Selected *versus* unselected seed. There was very little difference between the two contrasted plots. This most useful experiment will be started afresh on a larger scale with highly selected seed from an extensive area.

(*b*) *Sugarcane.*—Experiments were initiated with the object of ascertaining the effect of different ways of planting sugarcanes, but owing to the ravages of white ants and cane-borers the crop entirely failed.

(*c*) *Potatoes.*—The object of the experiment was to compare the merits of planting whole tubers (at the rate of 1,800lbs. per acre) and planting cut sets (at the rate of 1,164lbs. per acre). The experiment was tried in duplicate with the Ambala variety. The whole tubers gave an outturn of 1,276lbs. while cut sets gave 1,133lbs.

(*d*) *Jute.*—Two experiments were conducted with jute under this head, *e.g.*, (*i*) thick sowing *versus* thin sowing, and (*ii*) harvesting at different stages. Thin sowing gave an outturn of 21 maunds of fibre against 19 maunds obtained from thin sowing.

IV.—Experiments with Varieties of Crops.—In the paddy series two Bengal varieties were contrasted with two Bombay and two Punjab varieties. The plots were manured with 7½ maunds of castor cake and about 3½ maunds of saltpetre. The two Bombay varieties did the best both in grain and straw, while the two Punjab varieties fared the worst:—

Varieties.	Outturn of grain per acre in lbs.	Net profit in Rs.
Badshabhog (local)	2,362	34
Dadkhani „	2,670	13
Sukhavil (Bombay)	3,198	48
Kamrod „	3,213	50
Basmati (Punjab)	1,476	1
Begami „	1,970	12

Five different varieties of potatoes were tried. The following table shows the outturn and financial result:—

	Outturn in lbs.	Net loss or gain in Rs.
Patna	21,156	+82
Farrukhabad	19,680	+79
Bettiah	10,164	—84
Colgong	8,820	—98
Ambala	20,496	+25

The last was sown at the rate of 1,800lbs., while the others at the rate of 720lbs. (=9 maunds) per acre. The plots were manured with 12 maunds of castor cake and 6 maunds of saltpetre.

The result of the variety experiments with jute has already been noted in paragraph 6 above on the alleged deterioration of jute.

V.—Seed Distribution.—Over 80,000 cuttings of sugarcanes and 20 maunds of hill potatoes were distributed by the farm for experimental cultivation. Potato cultivation is now well established in the neighbourhood of the Farm.

Balance Sheet.—The total receipts of the Farm during the year amounted to Rs. 1,789 and the total expenditure to Rs. 3,387.

Dumraon Experimental Farm.

13. Area 30 acres, of which 22 acres are under cultivation.

The rainfall was 50·50 inches against 25·76 inches during the previous year and a normal of 42 inches. It was very heavy during July (18·28 inches), causing much damage to maize, *juar* and *bajra*, but on the whole it was favourable to the winter paddy. In the critical month of October however it was scanty. From November began a severe drought, which lasted to the end of the *rabi* season.

Samples of all the different manures used on the farm were submitted to the Agricultural Chemist for analysis, and the quantities applied per acre were calculated upon the result of the analysis. As at Burdwan the guiding factor in the manures was taken to be nitrogen.

I.—Manure Experiments.—(*a*) *Paddy.*—The scheme was to supply 40lbs. of nitrogen per acre. A mixture of castor-cake (19 maunds) and cowdung (4 maunds) gave the highest outturn of 2,280lbs. of grain per acre against 1,340lbs. from the unmanured plot. The profits were Rs. 22 and Rs. 7-8 respectively. Green manuring with *sunn* hemp gave 1,790lbs. of grain and a net profit of Rs. 15. Safflower cake gave a better outturn than castor cake. The experiment tends to show that a heavy dressing of saltpetre (about 7 maunds) or oil cake (8 maunds) alone, at their present prices is not economical.

(*b*) *Wheat.*—Scheme 40lbs. nitrogen per acre *Poudrette* gave the highest outturn of 1,226lbs. of grain per acre, followed by cowdung 1,130lbs. Castor cake and rape cake gave about equal results. Green manuring with indigo proved superior to that with *sunn* hemp, *kurthi*, or *mung*.

(*c*) *Sugarcane.*—As at Burdwan the crop was seriously damaged by cane-borers and white ants, and the outturns were not comparable.

II.—Trials with Implements.—The farm purchased the following implements during the year at a cost of nearly Rs. 300:—

(1) Poona four-coulter seed drill.
(2) „ interculturing harrow.
(3) „ bakhar.
(4) Surat two-coulter seed drill.
(5) „ interculturing harrow.

The Inspector-General who had recommended these implements, sent over a trained fieldman from Bombay, but unfortunately great difficulty was experienced owing to the local bullocks not being trained to go straight. Attempts are being made to train a pair of young animals. But in order to show the use of these implements to the best advantage, it is necessary to buy a pair of well-trained bullocks from Surat.

III.—Experiments in Methods of Cultivation.—One experiment only was made with Ambala potatoes, planted whole and in cut sets. The crop was green manured with *sunn* hemp in the rains and later on, directly with castor cake and saltpetre, giving 60lbs. of nitrogen per acre. The seed rate was 1,800lbs. for whole tubers and 1,600lbs. for cut sets. The former method yielded an outturn of 9,200lbs. against 8,200lbs. given by the latter method, but financially the experiment was a failure, as there is no local market for these superior varieties, which actually command a less price than the small waxy varieties of Patna and Bettiah.

IV.—Experiments with new Varieties of Crops.—(*a*) In the paddy series two local varieties were contrasted with two Bombay and two Punjab varieties, the same as at Burdwan. Here, too, the two Punjab varieties did the worst. The following table will show the results:—

	Outturn of grain in lbs.	Profit or loss in Rs.
Maharajwa (local)	2,410	24
Srikol „	1,810	12
Sukhavel (Bombay)	1,985	15
Kamrod (do.)	1,735	9
Basmati (Punjab)	1,110	— 5
Begami (dô.)	510	—21

(*b*) *Potatoes.*—Four varieties of potatoes were tried on plots manured as in the case of whole tubers and cut sets given above with the following results:—

Variety.	Seed rate in lbs.	Outturn in lbs.
Patna	1,200	13,920
Colgong	1,200	11,240
Ambala	1,800	9,840
Bettiah	1,200	10,600

(*c*) *Wheat.*—Experiments were made with 26 varieties of wheat supplied by the Inspector-General of Agriculture. There were the local, Bombay, Punjab, United Provinces, and Australian varieties. Some of the plots suffered from rust. Samples of diseased wheat were submitted to the Cryptogamic Botanist to the Government of India, who reported it to be "lemon rust," the most destructive kind of rust occurring in Northern India. Some, notably the

khapli or hard red wheat of Bombay, escaped it altogether. The plots in the north section of the farm under the manure experiment were not affected.

The Muzaffarnagar soft white variety and the Oudh red "deshi" variety gave the best results. An Australian variety also gave a good outturn. It was originally intended to try cross fertilisation with these but the experiment requires skill and delicacy to be acquired by practice. It is hoped the experiment will be more successful during the current year.

(*d*) *Sugarcane.*—Eight varieties of sugarcane were tried, but all, excepting two hardy varieties, succumbed to white ants and borers. The two hardy varieties were the *khari* of Bengal and the *hallu kabu* of Bombay.

(*e*) *Oats.*—Six different varieties of oats were tried with the following results:—

	Yield per acre.		Net profit or loss in Rs.
	Grain in lbs.	Straw in lbs.	
(1) Canadian Welcome	2,400	4,800	+25
(2) White Canadian	60	3,360	−11
(3) Algerian	120	3,600	− 9
(4) New Zealand	34	2,380	−16
(5) White tartarian	Failed to germinate.		
(6) Local (acclimatized)	4,800	6,400	+66

Nos. (2), (3) and (4) are late varieties, and the hot winds of March burnt up their ears before the grains had sufficiently developed.

(*f*) Five different varieties of Japanese soy beans were tried on a small scale. It appears that these can be grown throughout the year under irrigation. Analysis by the Agricultural Chemist to the Government of India shows that they are not only extraordinarily rich in nitrogenous or muscle-forming matter but also contain a high percentage of oil. They will be tried again on a larger scale.

(*g*) Eighty-four varieties of cotton (including seven American and two Egyptian varieties) were grown for cross fertilization. The seed was kindly supplied by the Inspector-General of Agriculture. The Egyptian varieties failed altogether. The American varieties, too, did not do well at all at the beginning, and they were further damaged by wild deer, but they are looking up now. Some early varieties (like the *jari* of the Central Provinces) have managed to live on under irrigation, and are producing flowers and bolls like the late varieties. This experiment, it is hoped, will throw light on the best varieties to introduce into Bengal. Some crossing of the flowers has been done.

Besides the above, different varieties of *arhar* (*Cajanus indicus*), mustard *juar*, *bajri*, maize, and sweet potatoes were grown for comparison. The American sweet potatoes are doing well, but have not yet been harvested. The *juar*, *bajri*, and maize were much damaged by heavy rain immediately after sowing in July.

Balance Sheet.—The total receipts of the year amounted to Rs. 714 and the total expenditure to Rs. 2,588.

Sibpur Farm.

14. Owing to insufficient rainfall in June and July, the cultivation of jute and paddy was not successful. With this exception, however, the agricultural operations of the farm last year were as successful as in any previous year. Manure experiments were carried on with regard to paddy, potatoes and cabbages, but there was no analysis of the manures. As in previous years, castor cake at the rate of 10 maunds per acre gave the best result for paddy; cattle dung at the rate of 150 maunds per acre gave good results, as also did manuring with bone-meal at the rate of 5 maunds and saltpetre at $2\frac{1}{2}$ maunds per acre. Unlike in other years, all these plots were this year first green-manured with *dhaincha*.

With regard to potatoes, the best result was obtained with castor cake at 20 maunds per acre, the outturn being 10,688 lbs. for the Patna variety and 9,453 lbs. for the Naini Tal. Fairly good result was also obtained from the application of 300 maunds of cattle dung to an acre, after green-manuring with *dhaincha*. Five maunds of saltpetre per acre for cabbages yielded a better outturn this year than 10 maunds of the same manure gave in the previous years,

and 15 maunds of castor cake per acre produced better results than double the quantity of that manure used in the preceding years. In the experiments with sugarcane, the tied canes gave better results than the free ones. Another experiment with regard to manuring of *ratooned* sugarcane showed that the yield of the second year's ratoon is greater than either the first year's crop or third year's ratoon.

The variety experiments with paddy showed the coarse Assam awned paddy to be the most prolific of the varieties tried. The next best result was obtained from Badshabhog, a fine *aman* paddy of Lower Bengal.

A large number of other crops, such as mulberry, rhea, cotton, *reana luxurians*, guinea grass, pea, gram, lentil, brinjal, *jowar*, tobacco was grown in the Farm in patches for purposes of demonstration to the Agricultural classes.

The income of the Farm during the year was Rs. 1,518-5-6 against Rs. 1,640-3-6 of the previous year, and the expenditure was Rs. 3,505-5-3 against Rs. 3,495-0-2 for the last year.

Sripur Cattle Farm in Saran.

15. This Farm of 900 acres is maintained by the Hathwa Raj as a cattle Farm, and naturally the best part of its area is devoted to the cultivation of fodder crops, a small area of about 32 acres only being reserved for experimental cultivation. In the experimental area, maize, fodder grasses, *bajra* (*Pennisetum typhoideum*) sugarcane, wheat, oats, potatoes, cotton, soy-beans (*Glycen hispida*) and American sweet potatoes were tried during the past year. Of the ten varieties of maize experimented with, Jaunpore maize (acclimatized on the Farm) gave the best result, while the imported American variety failed altogether. Each plot was manured with 50 maunds of cowdung per acre.

Ten kinds of fodder grasses were grown on the Farm during the Bhadoi season, and, as with maize, cowdung manure at the rate of 50 maunds per acre was applied to each plot. The largest outturn of green plants was obtained from local *jowar* (*Sorghum vulgare*) yielding as much as 563 maunds per acre in one cutting. Nilwa Jowar, the seed of which was sent by the Inspector-General of Agriculture, made a good second, with an outturn of 429 maunds per acre. *Amber Sorghum*, Sundhia Jowar and Impy yielded about the same outturn (250 maunds per acre). The maize crops proved unprofitable for fodder, and *Bajra* was damaged by heavy rain, while *Reana Luxurians* turned out a complete failure. Four varieties of sugarcane (viz. Poona, *Samsara*, *khari* and local) were tried, but the results were poor owing to insufficient supply of water in the farm well during the hot weather. Six varieties of wheat, viz. the Kirkee from Bombay, the Buxar white, the local red, the local white, the Nagpur and the Daudkhani were grown on plots manured with cowdung sufficient to supply nitrogen at the rate of 15 lbs. per acre, and saltpetre used as a top dressing at the same rate. The Nagpur and Kirkee varieties gave the best results both in grain and bye-product. The former yielded 19 maunds and 8 seers of grain and the latter 16 maunds and 29 seers per acre against only 9 maunds and 36 seers of the Buxar variety and an average outturn of 15 maunds 17 seers of the local varieties. Five varieties of oats were experimented with during the year, viz. the Tartarion, Canadian, Cape, Local and Hissar varieties. The first three varieties failed to germinate. The outturn of grain from the Hissar and the Local varieties averaged 11 to 12 maunds per acre. The plots had been green-manured with *sunn* hemp during the Bhadoi season.

Five varieties of potato, viz. Naini Tal, Kahalgaon, *Amragachi*, Cawnpore and Bettiah, were tried in two series of 5 plots each. The first series was green-manured with *sunn*-hemp during the bhadoi season, and then a top dressing of saltpetre at the rate of 5 maunds per acre was given directly to the potato plants. The plots in the second series received 10 tons of cowdung manure per acre, before plantation, and 5 maunds of saltpetre per acre when the potatoes were planted. The crops made a good start but were badly affected by frost in December last. The *Amragachi* variety proved to be the most prolific of the lot. The experiment with cotton crop was carried out in duplicate, the object being to compare the outturn of cotton when grown alone, with cotton and subordinate mixture. The crops are still standing on the ground.

Seeds of three varieties of soybeans received from the Inspector-General of Agriculture were sown on sandy soil. The plants were vigorous and the outturn was good. No artificial irrigation was necessary.

Three American varieties of sweet potatoes, viz: Nouse Mound, Jersey and Virginia received from the Inspector-General of Agriculture yielded a good crop, but the price offered being very low, the tubers were used as fodder.

The Overseer was deputed to Bombay in September last to learn the details of cross-fertilization. Experiments with this process are being carried on in the farm with cotton and wheat.

Silage was made with success during the year. Ordinary *jowar* of the district was cut when in full flower and stored in an uncut condition in one *pucca* and one *cutcha* pit, each measuring 30′ × 15′ × 10′. The first pit was opened after two months and its contents were given to the farm cattle which ate the silage with much relish.

The scheme of cattle breeding operation was materially changed during the year under report. It was at first decided that Hissar breeds were the best for refreshing the local blood in Upper Bengal. With a view to develop this work, 30 cows and 4 bulls and 4 bull-calves were purchased from the Hissar Government Farm in November 1901 and a bull-calf of Kheri breed was secured from the Agricultural Department of the United Provinces of Agra and Oudh. At a Conference held in the farm in November 1902 it was decided by Mr. Allen, Colonel Morgan, and Mr. Mollison that the breeding operations of the farm should be confined only to smaller strains that are indigenous to the districts of these provinces, and to smaller breeds which are known to be good in the Upper Provinces. Steps have since been taken to give effect to these suggestions. The indigenous cattle are to be kept for breeding draught animals suitable for these provinces and the Montgomery cattle for breeding good milkers as well as good plough cattle. Several buffaloes, goats and sheep were purchased for improving the breed of those animals.

The Tikari Home Farm.

16. The Home Farm continued to work fairly under the supervision of the Overseer who is a graduate of Saidapet College of Agriculture, Madras.

Jowar (*Sorghum Vulgare*) *rahar*, maize, sugarcane, tobacco, gram, linseed and peas were cultivated during the year under report. The results were on the whole satisfactory.

At present there are seven she-buffaloes, one stud bull buffalo and ten calves. The dairy worked satisfactorily until November 1902 when there was a fall in the supply of milk. It is hoped that the next rains will bring on a good supply of milk.

Chittagong Farm.

17. The report of the Farm for 1902-1903 is a record of useful work done in spite of an unfavouable monsoon. This farm has done much to improve the agricultural ideas in the district, and has led to the establishment of two agricultural farms, by Europeans, and of several minor farms by native gentlemen. The Farm is now being used for the purposes of agricultural instruction to the students of the local College, the Collegiate school and the Training school. During the year under report, an area of 54 acres close to the Model Farm was acquired by Government and was added to it. Another area, of 28·52 acres, known as Sir William Jones' Hill in Pahartali, about 2 miles from the site of the Farm which was relinquished by the Assam-Bengal Railway Company, has been added to the Farm for horticultural purposes. A portion of this area has already been cleared and prepared for the cultivation of fruit trees. The Central Province *aus* paddy, country *aus* and *aman* paddies, sugarcane, Patna and Ambala varieties of potato, and English vegetables and onions were grown during the past year, and in some cases, with marked success. The fine *aus* paddy from the Central Provinces is said to be suitable for high lands and can be successfully introduced into the Hill Tracts. It is reported to be as good as *aman* paddy, which can be grown after it on the same land, and it possesses the rare quality of resisting wild animals with its

long awns. Jute was entirely spoiled by heavy rains after sowing. *Patal* was also much damaged by the heavy rainfall of the year. Care has been taken this year to select more suitable plots for this highly popular vegetable crop. There was a large demand for *patal* roots, in fact much more than the Department could supply. Mustard (*rai* and *sweti* varieties) suffered from the uncertainty of the weather, the sowing time having been a continuous drought. Ambala and Patna potatoes were grown with success. Turnip was sown broadcast like raddish and the method proved fairly successful. Wheat, oats and gram yielded no better results than in previous years. These like other crops in Chittagong depend on the right time of sowing for their success and this has yet to be found out. Onions grown both from seeds and bulbs (the latter proving the best) were very encouraging. The bulb crop compared favourably with Spanish onions. Cabbages and cauliflowers gave a fair outturn, but the brinjals turned out indifferent. The *khari* variety of sugarcane has been abandoned on account of a fungus disease. *Samsara*, Puri, Poona and *Kajli* canes were grown in small areas and the process of unbinding and clearing the canes which is invariably followed by raiyats in this district was tried with success. Some new varieties of canes, Mauritius and south Marhatta have been planted during the year. Seeds of Patna and Ambala potatoes, *patal* roots, raddish seeds, plantain plants, tobacco seedlings, onion seedlings, *Samsara* cane-cuttings, seedlings of cabbages and cauliflowers were distributed or sold to the raiyats. The three-rollered Beheea mill and shallow evaporating pans for making *gur* continued to give satisfaction. The Sibpur plough is reported to be more suitable for the country bullocks than the Burdwan plough. The total expenditure of the farm during the year amounted to Rs. 9,214 of which Rs. 2,791 was capital expenditure on new works and Rs. 3,172 represented land acquisition charges. The expenditure was met from the grant of Rs. 7,600 for 1902-1903 of which Rs. 5,210 was actually spent and Rs. 831 from the allotment of 1901-1902. The receipts of the farm during the year from sale of produce amounted to Rs. 1,223-7-9 as compared with Rs. 997 in the preceding year.

Agricultural Experiments in Government and Wards' Estates.

18. In the last Annual Report of the Department, Mr. Allen deplored the inefficiency of the so-called agricultural experiments in Government and Wards' Estates which frequently fail from neglect and want of supervision, the cultivation being often decidedly inferior to that practised by the ordinary raiyats. He remarked that the money spent is to a large extent wasted at present and proposed the amalgamation of these funds for each division for the purpose of a demonstration farm, similar to the Chittagong Farm, near the head-quarters of a division or district as may be found suitable. This would not only facilitate supervision of experiments by the experts of this Department but the demonstration farms, when established, would prove centres of agricultural information to leaven the agricultural ideas and practices of the cultivators in the neighbourhood. Some definite proposals on the subject were submitted by him to the Board during the year under report and it is hoped that, when these are sanctioned, a real step will have been made towards the solution of the problem of popularising agricultural reforms. At present the supervision by the Department of these experimental cultivations in innumerable out-of-the-way places in the province is distinctly inadequate.

Burdwan Division.

19. Very little was done in the way of agricultural experiments in this division during the year under report. The cultivation of sugarcane in the Nayagram Ward's estate in the district of Midnapore failed owing to theft of plants, unproductiveness of the soil and ravages of white ants. In the Government Tehsil Office compound at Kukrihati in the same district potato has been cultivated with success and seed potatoes have been distributed gratis to selected raiyats for the last three or four years. The raiyats now appreciate the value of this crop and are indenting for seeds on their own account.

PRESIDENCY DIVISION.

20. Potatoes were cultivated with fair success at Port Canning in the 24-Parganas and in the Khas Mahals of the Bagerhat Subdivision in the district of Khulna. An improved variety of brinjals was tried with success in Murshidabad. Sugarcane, peas, and gram were also tried in the 24-Parganas and American and country maize in Murshidabad, but with very indifferent results. In Nadia about 2½ acres of land in a Government Estate in the Meherpur Subdivision has been experimentally cultivated with *patal* by Mr. K. M. Hamilton of the Nischindpur concern. About 75 per cent. of the plants have taken root. The raiyats of Khas Mahal Char Baniari who were reported last year to have been induced to grow potatoes on their land, have again gone in for it at their own expense and have derived an average outturn. The result of the experiment with potatoes in the Satkhira Sub-divisional Office compound was satisfactory, but it was not so satisfactory in the Khas Mahals of the subdivision.

RAJSHAHI DIVISION.

21. Forty-three maunds of seed potatoes were distributed amongst selected *jotedars* in the Duars Government Estates in the district of Jalpaiguri for experimental cultivation. The result was not satisfactory as the seeds were received late and in some places the plants were destroyed by insects.

During the past year, good Australian potatoes were imported by this Department and sent to the Deputy Commissioner of Darjeeling for experimental cultivation in that District. The result is not yet known as the crop is still in the field.

Little or nothing was done by way of agricultural experiments in the Jaipur Government Estates in the district of Bogra during the year under report. Out of a grant of Rs. 800 for miscellaneous, sanitary and agricultural improvements in this estate, Rs. 57-6-6 only were allotted for agricultural experiments and even this small sum was spent for items other than agricultural experiments, while the experiments with Patna potato had to be discontinued for want of funds. Serajgunge jute seeds were obtained from the raiyats to whom they were supplied in the preceding year and given to other raiyats to cultivate. It is hoped that the variety experiments with jute now being undertaken by this Department will create a demand for better seeds than the local varieties. *Samsara* and *khari* sugarcanes suffered considerably from excessive rainfall. The raiyats think the cultivation of *samsara* is not more profitable than that of the local varieties and the *khari*, though it yields a little more juice than the local canes, is very hard and therefore difficult to crush. Three cane-crushing mills belonging to the estate were let on hire to the raiyats on easy terms. The Behari bull maintained in the estate for breeding purposes was killed in a fight with a local stray bull.

Siri bulls have been kept at convenient and central places in the district of Darjeeling for improving the breed of cattle. The total number of these bulls was 14 during the year against 13 in the previous year.

Experimental cultivation of potatoes was undertaken in two villages in Government Estate Talukyar Mohamad in the district of Pabna; it was successful in one but failed in the other.

Experiments were made with potatoes, wheat, sugarcane and English vegetables in the several wards' estates in this division, but the last named crop only gave good results in the Maldwar and Churaman estates in the district of Dinajpur. Continued drought and bad seeds were, it is reported, the cause of the failure of the rest. Beheea mills and Sibpur ploughs are much appreciated by the raiyats of these estates.

DACCA DIVISION.

22. An experiment was made in the Government estates in the Tangail subdivision of the district of Mymensingh in the cultivation of wheat and potatoes. The results with neither crop were satisfactory, as the wheat was damaged by heavy rain and the potatoes were sown late. In Faridpur experiments were made with Patna potatoes and *samsara* variety of sugarcane.

Sugarcane was damaged by heavy rainfall. The outturn of potatoes was good in those plots which were manured with bone-dust. In some tahsil circles and in the Jail compound, the plants were destroyed by insects. Seed potatoes were distributed among the raiyats and there is a growing demand for them. It is likely that the cultivation of Patna potato will soon spread in this district. Naini Tal potato was cultivated with fair success at Tushkhali and Kazirchar in the district of Backergunge and seed potatoes were distributed among the *Khas Mahal* raiyats. English vegetables were also grown at Tushkhali with moderate success. Peas, gram, *rahar*, tried on a small scale, did very well. A small agricultural garden has been started at Tushkhali this year for growing country vegetables.

The following report is given by the Collector of Backergunge on the agricultural experiments in the Wards' Estates in his district:—

"No agricultural experiments and improvements were undertaken during the year in the wards mainland estates. The estates not yet being free from encumbrances necessary provision was not made in the budget. If, however, the proposed experimental farm be started in the district, these estates will be called upon to contribute their share of cost of the farm."

"Various indigenous seeds were tried in Dakhin Shabazpur estates at a total cost of Rs. 555, of which Rs. 18 only was recouped by the sale of the produce. I do not think, however, that the financial results can be regarded as a measure of success or failure. We have succeeded in growing better kinds of country crops. We can judge only of the result after a term of years."

A separate report on the work done by the Agricultural Travelling Overseer employed in Backergunge was submitted to the Board with Mr. Allen's letter No. 403A., dated the 27th February last. He observed that the Overseer had done useful work and had, in his opinion, justified his appointment. The Board have since sanctioned the retention of the services of the Overseer. I would venture to recommend this example of Backergunge to the attention of other District Officers, as affording a practical means of securing expert assistance in agricultural work of this kind.

The question of starting an experimental farm in Daulatkhan on *khas-mahal* lands is now under the consideration of the Commissioner of the Division.

Chitttagong Division.

23. *Chittagong.*—In the several wards' estates in this district, experiments were made with Rangpur tobacco, chilly, sugarcane, potato and English vegetables. They were generally successful.

Noakhali.—In the Government Estates in Noakhali, potatoes, gram, oats, peas and a fine *aus* paddy from the Central Provinces were tried. Potato was damaged by a kind of insect pest locally known as "Leda poka." Gram, oats, and peas did not thrive well. The Central Provinces *aus* paddy was very successful in the Government estates as well as in the Wards' Estates of the district. Sugarcane was tried in the estate of Bharat Chunder Shaha but the plants died owing to accumulation of water on the field during the rains.

Patna Division.

24. There was very, little in the way of agricultural experiments in the Wards' estates of this Division during the year under report, except in the Tikari Home Farm at Gaya and in the Sripur Farm of the Hathwa Raj in the district of Saran, which have been already dealt with in another part of this report.

The Bettiah estate in Champaran and the Narhan estate in Darbhanga undertook experiments on a small scale in the cultivation of improved varieties of staple crops, but owing to insufficiency of moisture in the soil and to the want of seasonable rain in December and January, the results were disappointing to a degree. Some fairly successful manure experiments with oats were undertaken in the *zerat* lands of the Bettiah estate. The outturn of the manured plot was a third as much again as that of the un manured plots. Oats and turmeric tried on virgin land recently reclaimed, yielded hopeful results. In the Government estates in the Bihar subdivision

of the district of Patna, Ambala potato and *jowar* were tried, but the result was not encouraging.

Bhagalpur Division and the Sonthal Parganas.

25. *Sonthal Parganas.*—In the Damin-i-koh Government Estate and in the Nankar Sunkara Ward's Estate in this district, experiment was made with Naini Tal and Ambala potatoes respectively; the result was, on the whole, satisfactory in the former estate. Potato seeds worth Rs. 20 were also distributed to the Damin raiyats for experimental cultivation. The Bhagalpur bull maintained by the Nankara estate having died, two bulls were obtained from Madhubani during the year. Both the animals appear to be excellent. Ambala potatoes and Muzaffarnagar wheat were successfully cultivated in the Government *khas mahals* in Monghyr. In the Khagra Ward's Estate in Purnea, paddy, oats, maize and English vegetables were cultivated. The result of the first three crops was not satisfactory, but maize and English vegetables gave an excellent outturn.

In the Lugma Ward's Estate in the district of Bhagalpore experiments were made with *samsara* and a local variety of sugarcane and with two varieties of paddy, but the experiments failed partially owing to flood in the Kosi river.

Orissa Division.

26. In Balasore *Jámáli* wheat and potato seeds were distributed among selected raiyats of the Nuanand Government Estate, and the result is reported to be satisfactory.

In Angul seeds of various crops were either distributed *gratis* or sold to the sarbarakars and khas mahal tenants. *Surguja*, Cuttack potato and onions, Muzaffarnagar wheat, Serajganj jute, *Dadkhani* paddy, Dumraon *arhar*, American maize and *Samsara* sugarcane produced satisfactory results, and the crops are said to be much appreciated by the people.

In Puri experiments with potato, onion, cabbages, sugarcane, tobacco, &c., were conducted in the gardens of Khurda, Kotedesh and Balukhand Government Estates. The result of the experiment was not satisfactory owing to the sandy nature of the soil and bad seeds. Satisfactory results were obtained with country and English vegetables grown in the Balukhand garden. Seeds of *Paspalum Delitatum* germinated well, but the plants did not thrive on the sandy soil.

In Cuttack sugarcane (*kantari*), Patna potato, oats, *mung* and castor were cultivated. The sugarcane cuttings were damaged by white ants after planting. The result of the experiment with other crops was not very hopeful.

The Raja of Talcher reports that wheat and potatoes were cultivated in his farm and by some of his raiyats. The wheat was damaged by heavy rains, but the potato crop was on the whole successful.

Dhenkanal State.—Paddy, sugarcane, potato, wheat, maize, *mung* and onion were cultivated in the farm at the head-quarters station of the State. The first two crops were successful, but the rest failed owing to irregular rainfall and want of proper supervision.

Baramba State.—Experiments were made with *Samsara* and Shaharanpur varieties of sugarcane, wheat, and potatoes. The result of the sugarcane experiment was satisfactory. Potato seeds were received late and the result was poor. Sugarcane cuttings and vegetable seeds were distributed among selected raiyats who appreciated them. One Sitamarhi stud-bull is kept in this State.

Narsingpur State.—Eight varieties of paddy, different kinds of pulses, wheat, *bajra*, linseed, cotton, &c., were cultivated in the State farm, but owing to insufficient rainfall and damages done by insect-pest the result was not encouraging. One Sitamarhi bull is kept here for breeding purposes. An Agricultural exhibition has been started in this State by the manager, and it was opened this year by the Superintendent of the Tributary Mahals, who distributed money prizes to the successful exhibitors.

Pal Lahara State.—In the State farm three varieties of maize, country and English vegetables, potato, onion, paddy, and sugarcane, were tried with good results.

CHOTA NAGPUR DIVISION.

27. Patna, Naini Tal and Colgong potatoes gave excellent result in the Ranchi Government Estates. In the Government Estates in Palamau, Ambala potato, peas, maize, tobacco and miscellaneous vegetables were grown, but the outturn was poor in all cases. Oats and potato were cultivated in the Government Estates in Singhbhum, but the experiment was not successful. In the several Wards' and Encumbered Estates in this division potato and English vegetables were tried, but the results do not appear to have been satisfactory except in the case of potato in the Nagarkiari Wards' Estate in Manbhum. In the Hazaribagh Encumbered Estate Juanpore maize was tried. The result on the whole was good.

Agricultural Experiments by Private Individuals.

28. The following gentlemen report results of experiments made in their own gardens:—

1. Babu Jogendra Narayan Mitra.
2. ,, Ram Hari Bhattacharji.
3. ,, Charu Krishna Majumdar.
4. ,, Brojendra Kishore Rai Chowdhry.
5. ,, Kunja Behari Bose.

During the year under report experiments were made with paddy, sugarcane, potatoes, jute, oats, mustard, pulses and English vegetables in the farm belonging to Babu Brojendra Kishore Rai Chowdhry, zamindar of Gouripur, in the district of Mymensingh. The result of the experiments was generally successful. The Collector reports that it is in contemplation of the zamindar to start a class for giving practical instructions to the boys of the cultivators and to provide them with a free board and lodging. This is a promising undertaking, as the zamindar takes great interest in it. Babu Kunja Behary Bose, of Calcutta, who has started a small farm at Natagor near the Sodepur railway station, was very successful in his experiment with English vegetables, the seeds of which he obtained through this Department.

Sugarcane Cultivation by the Indigo-Planters of Bihar.

29. From the reports received from the several Indigo Planters in Bihar who were supplied with sugarcane cuttings by this Department, it appears that the soil of the North Bihar districts is well suited to sugarcane cultivation. The canes thrive well in some places even without irrigation. It is hoped that if facilities for irrigation are secured and the cultivation undertaken on a large scale and at a reasonable cost, it will pay well.

Trial of Improved Agricultural Implements in Government, Wards' and Private Estates.

30. During the year under report three iron sugarcane mills, two evaporating pans, one Baldeo plough, one Burdwan plough and one hand hoe were distributed through the agency of this Department. A list of the new or improved implements that were tried in Bengal during the year is given in Appendix I.

Supply of Seeds, Manures and Implements.

31. A list of the seeds, implements, manures, etc., distributed by the Department during the year under report (exclusive of those used in experimental farms) is given in Appendix II. This is one of the most important items of work of the Travelling Overseers and occupies a great deal of their time.

Crop-cutting Experiments by District Officers and Settlement Officers.

32. With his letter No. 416A., dated the 26th February 1903, my predecessor, Mr. C. G. H. Allen, has submitted to Government a full report on the crop-cutting experiments which were conducted during the quinquennial period covered by the financial years 1897-98 to 1901-1902. In that report he has said that though some progress has been made during the quinquennium in the number of experiments and in the care with which the work has been done, yet there is still great room for improvement. He has also observed that a close examination of the present figures shows that they do not justify any general conclusions as to the yield of the several crops in different parts of the Province. With the object of effecting further improvement in these experiments revised instructions are being issued to the experimenting officers.

Analyses of different kinds of well water used for irrigation in the District of Patna.

33. During the year under report Babu Nibaran Chandra Chaudhuri, Travelling Overseer of this Department, collected samples of three kinds of well water used in the district of Patna for the purpose of irrigation. They are locally called *mithapani*, *kharapani* and *haraliapani*. The samples were sent to the Agricultural chemist to the Government of India for analysis, the result of which is noted below :—

	Parts per 100,000		
	Methapani.	Kharapani.	Haraliapani.
Total solids	42·40	619·20	250·40
Chlorine	5·16	99·52	67·80
Sodium chloride	8·58	164·64	111·72
Sodium sulphate	22·50	137·20	102·30
Saline ammonia	·41	·14	·34
Albuminiod ammonia ...	·19	·05	·10
Nitrogen as nitrates ...	...	7·42	Present.
Oxygen absorbed	...	·43	...

The *mithapani* is similar to ordinary well water of Upper India. The sample of *kharapani* is excessively saline and is characterised by a large amount of nitrate of potassium and sodium. The saline constituents of the *haraliapani* are contributed by sodium chloride and sulphate.

The analysis is most instructive and amply justifies the raiyats' own opinion of the value of the different kinds of water.

Utilisation of night-soil as manure.

34. With the object of promoting the use of night-soil as manure, my predecessor, Mr. Allen, deputed Babu N. C. Chaudhury, one of the Travelling Overseers of this Department, to visit the trenching grounds of the several municipalities in the neighbourhood of Calcutta with the object of introducing the right system of trenching, arranging to lease out the trenched ground to the raiyats and inducing them to have the filth trenched by the conservancy sweepers in their own lands. Accordingly the Overseer visited the trenching grounds of the municipalities of (1) South Suburban, (2) Cossipore-Chitpur, (3) Baranagar, (4) Garden Reach, (5) Budge-Budge, (6) Kamarhati and (7) South Dum-Dum. It appears from the reports submitted by him that the system of trenching at present in vogue in those places is far from satisfactory. Suggestions have been made for the introduction of the Meagher system of trenching. The municipal authorities have readily taken up our proposal, and action is being taken by them to carry it out with the assistance of this Department.

LOCUSTS AND OTHER INSECT-PESTS.

(1) Locusts.

35. In no part of Bengal Proper and Orissa did locusts appear during the year under report. In Bihar flights of locusts were seen in portions of

thana Gogri in the district of Monghyr, and in portions of the districts of Patna, Shahabad and Saran, where they appear to have done some damage to the standing crops.

(2) Other Insect-pests.

36. The large majority of District Officers report that their districts suffered no damage from insect-pests during the year. Common rice *hispa* occurred in small tracts in the district of Chittagong. *Spilosoma punctatum* was the identification given by the Entomologist of a caterpillar that did some damage to the *kalai* crop in the district of Dinajpur. The Collector of Champaran sent some specimens of insect-pests which did some damage to the vegetables and other crops in his district. The vegetable-pest was identified by the Entomologist as *Aspongopus janus* and the crop-pest as *Dysdercus Cingulatus.*

Reports have been received from Gaya, Shahabad, Jessore, Faridpur, Palamau, Manbhum, Cuttack, Rangpur, Jalpaiguri, Bhagalpur, and Murshidabad of insect-pests doing injury to a small extent to the *bhadoi* and winter rice, potato, tobacco and sugarcane crops, but they were not identified. In many cases specimens of the pests were not sent to the Entomologist for identification, and in several cases where they were sent, the conditions were such as to render identification impossible. I would again invite the attention of the District Officers to the necessity of having insect-pests occurring in their districts identified by the Government Entomologist, who also suggests remedies in many cases.

Sericulture.

37. The operations of the Bengal Silk Committee have now extended to the districts of Birbhum, Bogra, Malda, Murshidabad and Rajshahi. The Committee's overseers and sub-overseers stationed in those districts instruct the rearers in the selection of seeds by microscopical examination and rearing silk worms according to Pasteur's system. The Committee's Superintendent, Babu A. K. Ghose, is now employed largely in inspecting the nurseries established by the Committee or by private rearers and in supervising the work of the overseers and sub-overseers. The rearers have now learnt to appreciate the processes of Pasteur's system of rearing silk worms introduced by the Bengal Silk Committee.

38. The prospects of successful operation in the district of Birbhum are now hopeful. Three overseers have been appointed and the rearers have acquired confidence in the microscopically examined seed. The new nursery at Rammatty has continued to distribute excellent seed in large quantities to the rearers of this and other districts. It made a clear profit of Rs. 197-9 during the last *Kartic bund.*

39. The work in Bogra was started only in 1901, and during this short period there has been a good increase in the mulberry cultivation and a further increase is expected very soon. The rearers now have confidence in the modern methods and in microscopically examined seed and are again actually returning to their abandoned profession. The Silk Committee have one overseer and three sub-overseers in this district.

40. In Malda the improvement has been maintained and six new nurseries are reported to have been established during the year by private persons for the sale of examined seed and some rearers have had their rearing houses built on improved lines. The Superintendent has induced the Jote and Sujapur rearers to subscribe for rearing houses in their villages, and it is expected that two nurseries will be built there during the current year. The Committee's work in the Government Khas Mahals in Malda and towards Kaliachak, has been extended at the instance of the Collector, who takes a keen interest in the work of the Committee, and the result has been satisfactory. The District Board of Malda contribute Rs. 20 a month to the Bengal Silk Committee towards the pay of the sericultural staff in Malda.

41. In the district of Murshidabad good progress was made during the year under report. The new nursery at Kumarpore continued to distribute

excellent seed in large quantities and has worked at a profit. In the south of the district, the Chandanpur nursery failed to pay its way, but it is hoped that the Committee will take early steps to make the nursery as profitable as it was before. In the Government Khas Mahals a new nursery was started at Rajdharpore in *Chaitra* last, and the results obtained in the very first crop are most satisfactory. The rearers in these parts of the district are very backward but many of them have already been induced to use microscopically examined seed, and, at the suggestion of the Superintendent, the Committee have lately bought some mulberry lands for Rajdharpore and Gonatea nurseries. At Jemua near Kandi a sub-overseer has been posted and he did some good work during the last March *bund*.

42. The work in Rajshahi has on the whole progressed satisfactorily during the year. Numbers of rearers have had their rearing houses ventilated and the use of selected seed is spreading in all parts of the district. At the suggestion of Mr. T. G. Rice of Sarda, one nursery is to be opened in Baralpar near Kadirpur, and another at Baneswar or Horain in Palley Joars.

43. The total receipts of the Bengal Silk Committee during the year, including last year's balance of Rs. 666-6, were Rs. 21,019-3, and the expenditure amounted to Rs. 21,009-4-9 only. Government contributed Rs. 6,000 during the year.

44. *Rajshahi Diamond Jubilee Industrial School.*—This institution has been split up into two, viz.—(1) the Techinical School, and (2) the Sericultural School, with separate finances and separate managing committees. The District Board's grant of Rs. 1,200 a year is now equally shared by the two schools. The Government grant of Rs. 500 is allotted to the Sericultural School. The subjects of study in this school are limited to the theory and practice of silkworm culture, and the course is now limited to six months, thus giving two sessions in a year. The sessions are from 21st November to 20th May and from 21st May to 20th November. Scholars are not allowed during the tenure of their scholarships to learn reeling, weaving and dyeing. Eight scholarships are awarded by the Rajshahi District Board payable in each session to pupils who are sons of *bonâ fide* rearers of the district. One scholarship is awarded by the Malda District Board and another by the Puthia Estate. In the two examinations of 1902, 12 boys passed, 4 each in the first, second and third divisions. Four of the successful students have been provided with appointments by the Bengal Silk Committee, one has got an appointment in the Tippera Estate, and one has been employed by the Bogra District Board; the remaining six are practising at home in their own concerns. The Sericultural School reared cocoons of *deshi*, *nistari*, *Barapolu* and *Endi* varieties with much success. The experiment with some Italian seed sent by Dr. Quazat, of Padova, was also successful. The Technical branch is now teaching weaving of silk only.

I am sorry to notice that Babu Akhoy Kumar Moitra, B.L., late Honorary Secretary of the School, who used to take a keen interest in the welfare of the Institution, resigned during the year.

CHAPTER IV.

AGRICULTURAL EDUCATION.

Agricultural class at Sibpur.

45. All the six students of the second-year class who appeared at the final examination, and all the six students in the first year class who appeared at the annual examination, passed. The number of students in the second year class on the 31st March 1903 was six against the same number in the previous year, and in the first year class fifteen against six in the previous year. The large increase in the number of new admissions in the first year class is a hopeful sign. There are two special students in the second year class and three in the first year class. The special students wish to devote themselves to agricultural pursuits. The general students join the agricultural class more or less with the aim of obtaining Government or private service.

Of the six students who passed the final examination this year, one has been appointed to the Provincial Executive Service, one to the Subordinate Civil Service and two as Agricultural teachers in Zilla schools.

Spread of Agricultural Education.

46. It is gratifying to note that, in accordance with the recommendation of the Education Conference held at Simla in September 1901, steps are being taken for affording increased facilities for agricultural education to the various classes of the community. Government has sanctioned, as an experimental measure, (1) the establishment of small demonstration gardens in connection with one or two secondary schools in each Inspector's Division, and (2) opening of Agricultural classes tentatively for five years in the (1) Chittagong Collegiate School, (2) Dumraon High School, (3) Burdwan Raj School, (4) Howrah Zilla School, and (5) Gaya Zilla School at a cost of Rs. 1,000 a year for each school. The object of establishing school-gardens in secondary schools is simply to provide instructions in simple facts relating to agriculture. If the lessons there given be sufficiently practical, and each student be allowed to test his theoretical knowledge by cultivating a few square feet of land, there is no doubt that much useful knowledge about scientific farming will spread among the masses.

The Bengal Veterinary College.

47. A separate report on the working of the Veterinary College during the year 1902-1903 will be submitted in due course to Government. It is very satisfactory to note that all the eight students who appeared at the Diploma Examination have obtained diplomas.

CHAPTER V.

PUBLICATION OF AGRICULTURAL INFORMATION.

48. The Monograph on "The Silk Industry of Bengal," which was written in 1899-1900 by Mr. N. G. Mukherji, but could not be published so long for non-receipt from England of the plates required to illustrate it, has been revised in the light of the last census statistics and published.

49. The usual preliminary and final forecasts on the various staple crops of the Province were published regularly during the year. The Agricultural Statistics of the previous year and the Statistics of Minerals and Gems were also compiled and published in the sanctioned form, and the prescribed consolidated table showing the average prices of food-grains, etc., in Bengal, during the year 1901-1902 was prepared and issued. In accordance with the orders contained in paragraph 2 of letter No. 92—298-5, dated the 20th January 1902, from the Government of India, Revenue and Agricultural Department, a Season and Crop Report for the year 1901-1902 was published for the first time during the year under report.

CHAPTER VI.

FINAL.

Emigration to Burma.

50. The number of State emigrants carried from Bihar to Burma during the year under report was 797 against 1,540 in the previous year. The falling off in the number of emigrants is attributed to the virulence of the plague in the Bihar districts generally.

The emigrants are carried to Burma at reduced rates by the British India Steam Navigation Company, and one-third of the passage-money is paid as a subsidy in equal shares by the Governments of Bengal and Burma.

Agricultural Exhibitions.

51. The following Agricultural Exhibitions and Cattle Fairs were held during the year under report:—

Name of place where exhibition or fair was held.	District.	Government grant.
		Rs.
(1) Suri	... Birbhum	... 300
(2) Barasat	... 24-Parganas	... 100
(3) Khulna	... Khulna	... 250
(4) Rangpur	... Rangpur	... ...
(5) Kalimpong	... Darjeeling	... 500
(6) Falakata	... Jalpaiguri	... 200
(7) Santrabari	... Ditto	... 300
(8) Bogra	... Bogra	... ...
(9) Tangail	... Mymensingh	... ...
(10) Sitamarhi	... Muzaffarpur	... 100
(11) Berapur	... Shahabad	... 150
(12) Sonepur	... Saran	... 200
(13) Tintanga	... Bhagalpur	... ...
(14) Malda	... Malda	... 200
(15) Dumka	... Sonthal Parganas	... ...
(16) Khagra	... Purnea	... ...
(17) Cuttack	... Cuttack	... 100
(18) Rangamati	... Chittagong Hill Tracts	... 200

A brief account of each of the exhibitions and fairs named above is given in appendix III.

Provincial Museum.

52. In addition to the Indian Museum in Calcutta which is not dealt with in this report, there is only one small Museum at Dumraon. It contains specimens of—(1) cereals, (2) pulses, (3) millets, (4) drugs (indigenous), (5) dyes, (6) oilseeds, (7) fibres, (8) spices, (9) iron and wooden agricultural implements, and (10) miscellaneous articles of commercial value. These are usually taken to the Barahpur show every year and exhibited to the cultivators. It is located in a hall of the old Dharamsala building belonging to the Raj.

My predecessor, Mr. C. G. H. Allen, Mr. D. N. Mookerji, and the Subdivisional Officer inspected the Museum during the year.

Cost of Miscellneous Experiment and Enquiries.

53. The cost to Government of agricultural experiments and miscellaneous enquiries conducted under the direct supervision of the Department of Land Records and Agriculture during the year under report amounted to Rs. 5,798-11-10 against Rs. 4,696-13-8 expended in the previous year. The details of the expenditure will be found in Appendix IV.

Officers of the Department.

54. Babu Grish Chander Dutt, my Personal Assistant, has done very good work in the office, and the Department owes much to the technical knowledge of Mr D. N. Mookerji, Assistant Director.

55. I acknowledge gratefully the valuable advice and help received by the Department from Mr. I. H. Burkill, M.A., Officiating Reporter on Economic Products to the Government of India, Major Prain, I.M.S., Superintendent of the Royal Botanic Gardens at Sibpur, Mr. E. J. Butler, M.B., Cryptogamic Botanist, Mr. H. Maxwell Lefroy, Entomologist to the Government of India, Dr. J. Walter Leather, Agricultural Chemist to the Government of India, and Mr. D. Hooper, F.C.S., F.L.S.

I have the honour to be,

SIR,

Your most obedient servant,

S. L. MADDOX,

Offg. Director of Land Records and Agriculture.

APPENDICES.

APPENDIX I.

A list of Agricultural Implements and Machines which have been tested in Bengal during the year ending 31st March 1903 and of those in use which are reported to have met with more or less marked success.

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by native agriculturists.	REMARKS.
1	2	3	4	5	6	7	8	9	10
1	Behia sugarcane mills.	Crushing sugarcane.	Useful in extracting juice from the cane in a shorter time and with less labour and expense than by means of the ordinary wooden mills.	Rs. 68 to Rs. 135, according to kind and size of the machine.	Messrs. Thomson and Mylne of Behia, Shahabad.	Commissioners of Chittagong, Orissa, Dacca, Rajshahi, Patna, and Chota Nagpur.	An efficient machine for extracting juice from sugarcane. The price being prohibitive, the ordinary cultivators cannot purchase any for themselves. Becoming popular.	Two hundred and seventy mills sold by Messrs. Thomson and Mylne during the year.	
2	"Babu," 4 roller triple squeeze sugarcane crushing mills.	Ditto ...	Much superior to the old Behia mill.	Rs. 100 ...	Mr. C. F. R. Simpson Grant, No. 10 Gola Gokarnnath, R. & R. Railway, district Kheri, Oudh.	Commissioner of Patna.	Most useful; if initial cost be reduced to Rs. 75, it will supersede the Behia mill.	...	
3	Shallow evaporating pan.	Boiling sugarcane juice.	Yields best and highest outturn.	,, 30 ...	Messrs. Thomson and Mylne of Behia, Shahabad.	Commissioners of Chittagong, Patna and Orissa.	Proved very satisfactory. Its use is limited on account of its high price.	Six pans sold by Messrs. Thomson and Mylne.	
4	Sibpur plough.	Preparing lands for *rabi* crops, tilling lands, and soil inverting.	Found well for *rabi* crops and cheap soil-inverting plough.	,, 7 to 8 ...	Sibpur Experimental Farm.	Commissioners of Chittagong, Orissa, Dacca, Patna and Rajshahi.	A satisfactory plough.	Not used by native cultivators.	The Commissioner of Orissa says that it is too heavy for the ordinary bullocks of the Angul Government estate where it was used.
5	Indian plough	Tilling the ground.	Efficiency. Low price	Rs. A. P. 7 8 0	Messrs. Burn & Co., Howrah Iron Works.	Commissioner of Rajshahi.	Found to work well.	Two sold.	
6	Howard's plough.	For ploughing	Deep ploughing and inversion of soil.	60 0 0	Messrs W. Leslie & Co., Calcutta.	Commissioner of Patna.	A satisfactory plough, but too heavy and expensive for general use.	...	Used in the Tikari Home Farm, Gaya.
7	Martin's plough	For deep tillage	Simplicity of construction, inversion of soil, strength and durability.	...	...	Ditto ...	Cuts the roots of weeds while working with its toothed ploughshare.	...	
8	Howard Cotton "D."	For inverting soil.	Made of wrought and cast steel.	40 0 0	Can be obtained through Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	Continued to give satisfaction in the Sripur Farm.	...	
9	Bakhar (paring plough).	For grubbing lands which have been previously ploughed.	The knife of the bakhar is two feet long, and with two pairs of bullocks 2 to 3 acres of land may be worked in a day.	2 8 0	Made in the Sripur Farm, Saran, after the pattern of the one prepared in Poona.	Ditto ...	Very useful ...	...	Commonly used in the Deccan; found useful at Dumraon.
10	Planet Jr hand-hoe (American).	Lightly stirring up soil.	Sugarcane field can be hoed at smaller cost by it than by spade.	20 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	...	...	Used in thinning out and weeding jute on the Burdwan Experimental Farm.
11	Interculturing harrow of Poona.	Hoeing maize and other crops when about 6 inches high.	Saves the expense for hoeing with spade.	2 0 0	Agricultural Department, Poona.	Ditto ...	...	...	
12	Four-tined seed drill.	Sowing seed to equal depth.	...	5 0 0	Ditto ...	Ditto ...	...	...	
13	Rake ...	For collecting grasses in the field.	Strong	6 0 0	Made in the Sripur Farm, Saran.	Ditto ...	Works effectually	...	
14	Maize huller	Separating grain from cobs.	The work of pulling done in a day is about 10 maunds.	100 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	"The machine was found to separate grain from cobs very effectually. It can be well recommended for small farms."	...	

APPENDIX I—*concluded.*

A list of Agricultural Implements and Machines which have been tested in Bengal during the year ending 31st March 1903 and of those in use which are reported to have met with more or less marked success—concluded.

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation or reporting officer.	Opinion.	Extent to which used by native agriculturists.	REMARKS.
1	2	3	4	5	6	7	8	9	10
				Rs. A. P.					
15	Winnower ...	Winnowing *rabi* crops.	It separates dust and small chaff from grain very effectually.	200 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Commissioner of Patna.	...	...	It separates dust and small chaff from grain very effectually, but it is not as useful for separating grain from bhoosa at the outset. The machine has been found in the second winnowing to clean very satisfactorily about 40 maunds of oats and 60 maunds of wheat and barley in a day with four labourers.
16	Chaff-cutter	Cutting fodder into slices.	Cuts fodder at the rate of 2 maunds per hour.	150 0 0	Ditto ...	Ditto ...	...	...	Used in the Tikari Home Farm, Gaya.
17	Ditto ...	Ditto ...	The amount of chaff cut in a day of eight hours is about 50 maunds, a result which is achieved by the work of six coolies.	200 0 0	Ditto ...	Superintendent, Sripur Farm.	...	...	
18	Iron Seed Bin	...	Six feet in height and 4 ft. in diameter, and can hold 40 maunds of grain.	15 0 0	Made in the Sripur Farm, Saran.	Ditto ...	The bin has been found very useful in protecting grain from rats and insect-pests.	...	
19	Indigo rake and cultivator.	Breaking clods and gathering weeds.	Gathers weeds and does the work of chauki.	8 0 0	Tikari Manager's Workshop, Gaya.	Commissioner of Patna.	...	...	Used in the Tikari Home Farm, Gaya.
20	Portable lever press.	Baling hay, hides, cotton, jute, &c., in small bales.	Efficiency. Low price	300 0 0	Messrs. Burn & Co., Howrah.	...	...	Three sold.	
21	Pumps ...	Irrigation, &c.	Ditto ...	Rs. 300 to Rs. 500.	Ditto ...	...	...	Thirty-nine sold.	
22	Iron *done* ...	For lifting water from small depth.	Lighter and more durable than the wooden *done*.	8 0 0	Rampurhat, Birbhum.	Commissioner of Patna.	...	...	Used both at Burdwan and Dumraon Farms.
23	Flour mills ...	Grinding wheat.	Efficiency. Low price	110 and upwards.	Messrs. Burn & Co., Howrah.	...	...	Four sold.	
24	The "Humming Bird" cream separator.	For separating cream from milk.	Easily portable; very useful for small dairies.	200 0 0	Aligarh Dairy Farm.	Commissioner of Patna.	Very simple and substantial; leaves no cream in separation.	...	
25	Butter churn	For churning cream.	Separates butter from cream.	70 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	Produces the desired result in a short time.	...	
26	Butter worker	For separating water from the manufactured butter.	Separates butter from water.	27 0 0	Ditto ...	Ditto ...	...	...	
27	Eclair Vaporizer.	For applying insecticides to diseased crops.	Simple and efficient ...	50 0 0	Can be obtained through the Agricultural Department, Bengal.	Ditto ...	Found to work usefully in the Sripur Farm.	...	

APPENDIX II.

List of seeds and manures distributed by the Department during 1902-1903.

	Seeds.	Mds.
1.	Potato	380
2.	Gram	19
3.	Wheat	25
4.	*Patal* root	4
5.	Oats seed	150
6.	Paddy	30
7.	Maize	5
8.	Castor seed	1
9.	Sugarcane	about 280 kahans (1 kahan = 1,280 cuttings)

also jute, ground-nut, cotton, brinjal, lucerne, sorghum, jeera, *sunn* hemp, rhea, *khesari*, barley, *mung*, mustard, chilly, tobacco, onion, radish and other seeds.

Manures.	Mds.
Bonemeal	60
Castor cake	174
Rape cake	15
Saltpetre	21

APPENDIX III.

Agricultural Exhibitions.

The Suri Cattle and Produce Show.—This fair was held from 11th to 17th February 1903. The Committee of Management consisted of many European and native gentlemen with Mr. Ahmad, the Collector, as its President. The show is gaining in popularity year by year, as the increased number of exhibits and financial support unmistakeably testify. An overseer of this Department was sent with a cream separator and a butter churn, and he showed the process of butter-making to the assembled people. The Gunatia Silk Factory sent cocoons and silkworms, and arrangements were made to demonstrate to the people the scientific method of culture and the care of the worms. Fly-shuttle looms were also secured from Serampore, and their working proved of great interest to the local weavers. A fair collection of bulls, bullocks, heifers, cows and steers was exhibited, and the prize-winners this year were a better lot than those of previous years. There were a good number of poultry and two good flocks of sheep, which were much admired. The exhibits of agricultural produce, silk and cotton fabrics, and local manufactures, were also appreciated by the public. The receipts in aid of the show, including the Government contribution of Rs. 300, came up to Rs. 3,272-1, and the disbursements amounted to Rs. 3,268-3-3, leaving a balance of Rs. 3-13-9 only in the hands of the Committee. Out of the Imperial grant of Rs. 500, for award of special prizes to cattle at this show only Rs. 235 was spent.

2. *The Barasat Agricultural Show in 24-Parganas.*—This show was opened on 14th February 1903 and lasted for three days. A large collection of paddy of different varieties, jute, sugarcane, English and country vegetables, and fruits of rare size and quality were exhibited at the show. The most interesting of the agricultural exhibits were an assortment of eight kinds of fibres, extracted from plants common in the subdivision, which were exhibited by Babu Jotindra Nath Bose of Jamalpur, Deganga. These fibres resemble jute, and are apparently stronger. Another assortment of eleven different kinds of manures exhibited by the same gentleman formed an interesting feature of this branch of the exhibition. At the request of the Executive Committee this gentleman wrote a short essay on the subject of his experiments with different manures for the benefit of the cultivators. Money prizes as well as a few silver medals, amounting in value to about Rs. 300, were awardad to the exhibitors, Babu Jogendra Nath Bose receiving a prize of Rs. 25 and a silver medal. Rupees 100 was granted by Government in aid of this show.

3 *The Khulna Exhibition.*—The occasion of the Coronation of His Most Gracious Majesty the King-Emperor was availed of to revive an Exhibition at Khulna which ceased to exist since 1896. Agricultural products of the district and articles of indigenous manufacture were exhibited. The District Board of Khulna made a special grant of Rs. 100 to arrange for the exhibition of fly-shuttle looms, and some teachers of the technical schools of Dacca and Serampore were brought to demonstrate the working and the usefulness of the machines to the local weavers, who evinced great interest in them. An overseer of this Department demonstrated the process of butter-making by means of a cream separator and a churning machine. Money prizes, amounting to Rs. 166-8-0 besides 12 medals and certificates, were given away to the successful exhibitors. Government contributed Rs. 250 in aid of this exhibition.

4. *The Rangpur Exhibition.*—An Agricultural and Industrial Exhibition was held at Rangpur in the first week of January last in connection with the celebration of the Coronation of Their Imperial Majesties. There were exhibits under twenty different heads at the exhibition, of which the most notable were, in the Agricultural section, some fine samples of tobacco, jute, paddy and sugarcane grown in the district, and specimens of ivory-carving, carpet-making and bamboo articles in the Arts section; and tobacco, jute, paddy and sugarcane in the Agricultural section of the district. The fly-shuttle loom of the local jail and a paddy-husking machine invented by the assistant jailor of the same jail, were also exhibited, and the process of their working was demonstrated to the assembled crowds. A sum of Rs. 381 was distributed in prizes to the successful exhibitors

5. *The Kalimpong Exhibition and Fair.*—This important annual fair was held on the 26th and 27th November last. The *mela* showed a decided improvement on previous years as regards entries and quality of exhibits. The improvement was most marked in the Cattle section, due to the special prizes of Rs. 500 granted by the Imperial Government for the improvement of the local breed of cattle. The poultry made a good show, and in connection with them the good influence of the *mela* is increasingly manifest. The grains were much as usual. The exhibition received no less than Rs. 1,750 from public funds: this Department contributed Rs. 500 and the Darjeeling Improvement Fund Rs. 500, special *mela* prizes amounted to Rs 250 and the Imperial grant of Rs. 500 alluded to above. The amount spent on prizes in all sections of the exhibition was Rs. 1,813.

6. *The Falakata Fair.*—This fair commenced on the 2nd February 1903, and lasted for one month. The Government contribution of Rs. 200 in aid of this fair was spent in making sanitary arrangements and providing for amusements to attract the people. The principal articles brought in for sale were brass utensils, blankets, yak tails, Bhutia ponies and dogs, and musk. Rupees 27,000 worth of articles changed hands during the session, and the average daily attendance at the fair was 250.

7. *The Santrabari Fair.*—This fair, which formerly used to be held at Alipur, was transferred to Santrabari during the year under report. It commenced on the 8th January 1903 and lasted till the 13th idem. The Government contribution of Rs. 300 in aid of this fair was spent in erecting sheds, making sanitary arrangements, and giving prizes for athletic sports. This year's fair can hardly be said to have been a success, which may be due to the change of site. The Commissioner of the Rajshahi Division recommends that the fair should go on at this place for a year or two more.

8. *The Bogra Exhibition.*—The Agricultural and Industrial Exhibition which used to be held at Rukindipur in Bogra was held this year at the headquarters station in the first week of January 1903. A sum of Rs. 300 was raised by local subscription in aid of this exhibition. Out of 71 prizes, with an aggregate value of Rs. 216, forty-four were awarded to agricultural exhibits. In opening the exhibition the Collector, in a suitable speech in vernacular, explained to the assembled people the necessity and advantage of growing new crops and of the improvement of the old staples of the district.

9. *The Tangail Industrial and Agricultural Exhibition.*—This Exhibition was held at Tangail in Mymensingh on the 21st February last and was open for six days. There was a varied collection of agricultural products, which demonstrated how the cultivation of potatoes, sugarcane, and English vegetables was expanding in the district. Among the more noticeable of the local artware exhibited were some bell-metal goods, several specimens of wood-carving, and a number of silk and cotton fabrics. Two fly-shuttle looms were worked at the exhibition in the presence of a large number of weavers, who took great interest in their working. A rope-making machine was also exhibited and its working shown. Besides indigenous products, a large number of exhibits came from Benares, Dacca, Calcutta and Assam. Eight gold medals, 18 silver medals, besides many money prizes and certificates, were awarded to the successful exhibitors.

10. *The Cattle Fair at Sitamarhi in Muzaffarpur.*—This fair was held on the 7th April last. Mr. Burke, Assistant Superintendent, Civil Veterinary Department, was present at the fair and assisted in the judging of the cattle. The number of cattle brought to the *mela* this year was about the same as that of last year, but the quality of the animals was distinctly inferior. Seven good buffalo cows were exhibited, and two of them were awarded prizes. Rupees 435 was distributed as prizes from the local fund, but only Rs. 140 was awarded as special prizes from the Imperial grant of Rs. 500 owing to paucity of exhibits of distinct breeds of good *desi* cattle. Rupees 100 was contributed by Government in aid of the fair.

11. *The Barahpur Show.*—The Barahpur Cattle and Agricultural Show in the district of Shahabad was held this year on the 25th February last. The Subdivisional Officer of Buxar, the President of the Show Committee, notices with regret the general apathy of the leading planters. The local subscriptions in aid of the show, including the grant of Rs. 500 by the Dumraon Raj, amounted to Rs. 660 only. Rupees 150 was paid by the Local Government and Rs. 500 and two silver medals were assigned from the special Imperial grant for the improvement of cattle-breeding in this Province. Veterinary-Major Raymond, who assisted in judging the horses and cattle, was satisfied generally with the quality of the animals exhibited; and Mr. D. N. Mukherji, my Assistant Director, helped in judging the agricultural exhibits, which were also satisfactory. A fly-shuttle loom and a cream separator were exhibited by this Department.

12. *The Sonepore Horse and Cattle Fair.*—The fair was held from the 8th to the 22nd November 1902. The number of animals brought to this year's *mela* was as follows:—Elephants 595, horses 2,652, ponies 1,965, camels 14, cows 520, bullocks 14,015, buffaloes 451, and birds of different species 2,500. No less than 550 elephants, 2,780 horses and ponies, 8 camels, 250 cows, 13,110 bullocks, 351 buffaloes and two-thirds of the total number of birds were sold. The total value of all goods and cattle that changed hands was estimated at Rs. 5,90,250. Veterinary-Major Raymond visited the fair and helped the Committee in judging the animals for prizes. Twenty prizes of the aggregate value of Rs. 380 were awarded from the local fund, which includes the Government contribution of Rs. 200, and out of the Imperial grant of Rs. 500 Rs. 70 only could be distributed in three prizes, as there were no eligible competitors for the balance of the prize-money. No *desi* bulls competed, but four bulls of the Patna breed of good quality were seen.

13. *The Tintanga Agricultural Show.*—The *mela* this year was held on the 12th February 1903 and on the two following days. Nearly 20,000 people assembled on the busiest day. Prizes were as usual distributed for agricultural exhibits. The total receipts this year from all sources amounted to Rs. 276-3, and the expenditure came up to Rs. 269-6.

14. *The Malda Agricultural Exhibition.*—A very successful agricultural exhibition was held this year at Malda in connection with the celebration of the Coronation of Their Imperial Majesties. It was held on the 6th to 8th February last. The exhibits, though not very large in number, were excellent in quality, and on the whole the show was much appreciated by the people. It is hoped that the fair will continue to develop every year. Money prizes and medals were awarded for cattle, ponies, sheep, poultry, paddy, different kinds

of food-grains, oilseeds, vegetables, fruits and articles of local manufacture. Government contributed Rs. 200 in aid of this show, and an overseer of this Department demonstrated the process of butter-churning by means of a cream separator and churn. The total income of the exhibition from all sources amounted to Rs. 1,288, which was just sufficient to meet the expenditure.

15. *The Dumka Exhibition.*—An Agricultural Exhibition was held at Dumka in January last. It was first started in 1893, and it has since been held every year in the cold season, the principal object being to encourage the production of high-class indigenous articles, natural and manufactured. Prizes are distributed to the successful exhibitors, and the expenses are met by private subscription. This year Rs. 449 were distributed in prizes to the best exhibitors of agricultural products, cattle, and locally manufactured articles. Mr. N. G. Mukherji, formerly Professor of Agriculture at the Sibpur College, procured some seeds of rice, fodder crops, sugarcane, &c., from Sibpur, which were much appreciated by the people generally. The seeds so exhibited were afterwards distributed, free of charge, to people who are likely to make good use of them.

16. *The Khagra Mela.*—This year's report of the *mela* is a record of continued success, especially in its financial aspects. The fair lasted for a month from 4th January to 3rd February 1903. The exhibits also were more numerous and of better quality than in previous years. The attendance was the largest on record, and although there were some cases of shop-lifting before the police arrived they were quickly put down, and the subsequent police arrangements, as well as the sanitary arrangements, left nothing to be desired. A particular feature of the *mela* this year was that large numbers of elephants were brought in and sold, and it is hoped that a still larger number will be brought in next year. The quality of the cattle at the fair is improving year by year and the sales were good. The receipts of the estate from the fair amounted to Rs. 11,921-3-6, being an increase of Rs. 2,489,-0-3 over the previous year's receipts. The total expenditure amounted to Rs. 3,462-1-3. No prizes were awarded at the exhibition, although the attention of the Manager of the estate was drawn last year to the advantage of devoting a few hundred rupees from the large profits of the show to this purpose.

17. *The Cuttack Agri-Horticultural and Industrial Exhibition.*—This year the Exhibition was opened by the Divisional Commissioner, Mr. K. G. Gupta, on the 3rd January last. The exhibits were on the whole satisfactory, while the attendance this year was much larger than that of any previous year. The working of the butter-churn and other agricultural implements exhibited by this Department was witnessed with great interest. The total expenditure this year amounted to Rs. 1,165-2-10, out of which Rs. 566 was spent in awarding prizes to the different classes of exhibits. Government contributed Rs. 100 in aid of this fair.

18. *The Rangamati Fair.*—An Agricultural and Industrial Exhibition was held at Rangamati in the Chittagong Hill Tracts on the 16th and 17th February 1903. It was a fairly successful show, considering that this is the first year of its existence, and that the people to be attracted are all hill tribes. The Bohmong, Chakma, and Mong Chiefs were present, as also some 60 headmen. Notwithstanding the inclemency of the weather, which prevented many from coming in with exhibits, there was a fair collection of country manufactures and produce. Government contribution in aid of this show was Rs. 200, which was distributed in prizes. The number of people attending averaged 4,000 daily; and the money value of articles that changed hands in the *mela* was about Rs. 8,000. The fair has started well, and it is hoped that under the tactful guidance of Mr. Hutchinson, the Superintendent of the Chittagong Hill Tracts, it will continue to grow.

APPENDIX IV.

Expenditure on miscellaneous experiments and enquiries made by the Department.

			Rs.	A.	P.
(1) Experiments other than those made in experimental farms ...	...		2,061	4	8
	Rs.	A.	P.		
(*a*) Cost of Australian seed potatoes ...	45	10	5		
(*b*) Purchase of seed potatoes ...	1,015	5	3		
(*c*) Ditto of other seeds and manures	314	14	6		
(*d*) Miscellaneous	685	6	6		
	2,061	4	8		
(2) Pay and travelling allowance of the agricultural overseers			2,157	2	5
(3) Purchase, &c., of implements			528	4	0
(4) Miscellaneous, including Rs. 408 for pay and travelling allowance of the Head Master, Rampur Boalia Diamond Jubilee Industrial School, and Rs. 407-4-3, being additional expenditure for importation of Australian cattle from Brisbane			1,052	0	9
Total ...			5,798	11	10

B. S. Press—5286J—511—1-7-1903—W. L. W. and others.

REVENUE DEPARTMENT.

AGRICULTURE.

DARJEELING THE 5TH OCTOBER 1903.

RESOLUTION—No. 2187T.—R.

READ—

The Report of the Agricultural Branch of the Department of Land Records and Agriculture for the year 1902-1903.

Letter No. 6139A., dated the 7th August, 1903, from the Board of Revenue, submitting the Report with their remarks.

Read again—

Resolution on the same Report for 1901-1902.

THE Department was in charge of Mr. C. G. H. Allen from the 1st April, 1902, till the 28th February, 1903, while for the remainder of the year Mr. S. L. Maddox officiated as Director. If 38 days spent by Mr. Allen on deputation with the Irrigation Commission be included, altogether 202 days were spent on tour by the Director and Officiating Director in connection with settlements and agricultural work during the year under report. Special attention was directed, during the tours of these officers, to the working of veterinary dispensaries, the development of sericultural operations, and the question of establishing an Agricultural Research Station at Pusa; inspections were also made of the Burdwan, Sripur, Dumraon and Sibpur Farms, and of the agricultural research work conducted at Peepra and Dalsingsarai.

2. *Scientific Enquiries.*—Enquiries were continued during the year as to the effect of the imposition of countervailing duties: so far as can be ascertained at present in this Province, it would appear that these duties have not had the effect of stimulating the indigenous cultivation of sugar or of arresting the decay of the sugar refining industry.

The enquiry as to the alleged deterioration of jute referred to in last year's Resolution was continued during the year: seeds of different varieties were procured locally from the most important jute districts and sown at the Burdwan Experimental Farm. The result of the continued selection of jute seed on this farm has been satisfactory, and it is hoped that the experiments which have been extended this year to the districts of Mymensingh, Jalpaiguri and Faridpur will lead to greater attention being paid to this important subject. The Director has recently brought to the notice of Government the excessive proportion of moisture found in jute offered for sale, and special enquiries are being conducted by him as to the alleged practice of fraudulently watering the fibre, and as to the measures which are necessary to prevent this form of deception.

3. *Experimental Farms and Experiments in Government Estates and Wards' Estates.*—Experiments with various manures, crops and methods of cultivation were carried on, as in former years, at the Burdwan and Dumraon Experimental Farms. The results of the trials at the Burdwan Farm of the deep-shared Sibpur plough have amply proved its superiority to the local plough; the trials at the Dumraon Farm of implements procured from Bombay failed, because the local bullocks are not accustomed to them. Important experiments with different varieties of cotton were tried at the last-named farm, the results of which will, it is trusted, help to solve the problem as to the varieties which may most suitably be introduced in this Province.

At the Sripur Cattle Farm in Saran, the system of cattle-breeding has been materially changed during the year under review in conformity with the advice of experts: the practice of importing cattle of the Hissar breed, in order to cross them with local cattle, has been abandoned for the present, and efforts are being made to improve and develop the indigenous strains of this Province without having recourse to foreign stock.

The Lieutenant-Governor has observed with gratification the beneficial influence of the Chittagong Farm, which has, it is reported, done much to improve the agricultural knowledge of the people of the district, and, in particular, has led to the establishment in the district of several similar farms.

His Honour is pleased to notice the useful work done by a travelling overseer in the district of Backergunge, and agrees with the Director that District Officers might with advantage follow this example and endeavour to obtain expert assistance in agricultural work.

Mr. Allen in his Report for the year 1901-1902 drew attention to the fact that many of the experiments which are conducted in Government and Wards' estates fail, owing to neglect and want of adequate supervision. He urged that demonstration farms should be established near the head-quarters of each district, where they could be supervised by the District Officer, and that the money now devoted to petty and isolated experiments might be much more usefully spent in the form of contributions to such farms. The scheme submitted by Mr. Allen with the object of giving effect to these proposals, and, generally, of reorganizing the Agricultural Department of the Province on a popular basis, so as to bring it into direct relations with the classes of the community which are dependent upon agriculture, has been duly considered by Government. After giving the subject his most careful attention, the Lieutenant-Governor reluctantly came to the conclusion that Mr. Allen's scheme was too ambitious, and that, for the present, the Bengal Agricultural Department should devote itself especially to research work, and that gradually, and in due course, this work could be usefully combined with the demonstration of results. In accordance with these views, His Honour has decided that the Research Station, with an Agricultural College and classes attached to it, which will, it is hoped, shortly be opened in Bengal, should, in future, form the nucleus of all research work in this province, and that round this centre should be grouped experimental farms, one in each Division, manned by minor experts trained at the Research Station, and conducted on the strictest possible scientific principles. Research work would be carried on in these Divisional farms, and the superiority of improved agricultural methods would also be demonostrated on them, or on farms situated in Government or Wards' estates. The Director's proposals for giving effect to these orders will be awaited by Government.

4. *Sericulture.*—The efforts of the Bengal Silk Committee, which have for some years been assisted by Government, to restore the silk-rearing industry by instructing the rearers how to select seed and to rear silkworms have been attended with a considerable measure of success, and the record of the work done during the year is one of continuous progress. In Birbhum, where the operations of the Committee last year were unsuccessful, prospects are now hopeful; in Bogra, it is gratifying to observe that confidence in modern methods has been secured, and that the rearers of silkworms are now returning to their abandoned occupation. In the other districts to which the operations of the Committee have extended, viz., Malda, Murshidabad and Rajshahi, fresh nurseries have been established, the use of selected seed is spreading, and the work of the Committee has generally had most beneficial results. Sericultural instruction is imparted in the Industrial School at Rampur Boalia, of which the Sericultural School is a separate branch. The award of eight scholarships by the District Board of Rajshahi to sons of *bonâ fide* rearers, as also the scholarships given by the District Board of Malda and the Puthia Estate, are calculated to encourage the development of the silk industry. The success of the students in passing the examinations and in obtaining employment subsequently are satisfactory features in the working of the school.

5. *The Sibpur Agricultural Class.*—The results of the examinations reflect credit both on the teaching staff and the students; while the large increase in the number of admissions in the first-year class is decidedly encouraging.

6. *Spread of Agricultural Education.*—In accordance with a recommendation made by the Education Conference held at Simla in the year 1901, steps are being taken to afford greater facilities for instruction in agricultural methods. With this object Government has sanctioned, as an experimental measure, the establishment of demonstration gardens in connection with

a few schools in the division of each Inspector of Schools, as also the opening of agricultural classes in five selected schools.

7. The Lieutenant-Governor fully recognizes the large amount of important work connected with agriculture which devolves on the Director in addition to his other duties, and the question of affording him expert assistance is, at the present time, under the consideration of the Government of India. His Honour is prepared to give favourable consideration to any reasonable suggestions which may be made by the Director for increasing the subordinate expert staff with the object of carrying out the scheme of work mentioned in paragraph 3 of this Resolution.

8. The thanks of the Lieutenant-Governor are due to Mr. Allen for the zeal with which he managed the Department during his tenure of the office of Director and to Mr. Maddox for an interesting report. The commendations bestowed by Mr. Maddox on Mr. D. N. Mookerji, Assistant Director, and Babu Grish Chandra Dutt, Personal Assistant to the Director, have been duly noted.

By order of the Lieutenant-Governor of Bengal,

A. EARLE,

Offg. Secy. to the Govt. of Bengal.

No. 2701T.—R.

COPY forwarded to the Secretary to the Board of Revenue, Land Revenue Department, for the information of the Board.

No. 2702T.—R.

COPY forwarded to the Director of Land Records and Agriculture, for information, with special reference to the concluding sentences of paragraphs 3 and 7.

No. 2703T.—R.

COPY, with a copy of the report, forwarded to the Appointment Department of this Government, for information, with special reference to paragraph 8 of the Resolution.

By order of the Lieutenant-Governor of Bengal,

L. S. S. O'MALLEY,

Under-Secy. to the Govt. of Bengal.

DARJEELING,
The 20th October 1903.

B. S. Press—3164C—59 1—7-11-1903—E. G.

REPORT

OF THE

AGRICULTURAL BRANCH

OF THE

DEPARTMENT OF LAND RECORDS AND AGRICULTURE,

BENGAL,

For the year ending 31st March 1904.

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DEPARTMENT OF LAND RECORDS AND AGRICULTURE, BENGAL.

No. 1775A.

FROM S. L. MADDOX, ESQ., I.C.S.,
Offg. Director of Land Records and Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE, L. P.

Dated Calcutta, the 16th June 1904.

SIR,

I HAVE the honour to submit the Nineteenth Annual Report of the Agricultural Branch of this Department, prepared in accordance with the orders contained in letter No. 92-298—5, dated the 20th January 1902, from the Government of India, Revenue and Agriculture Department.

CHAPTER I.

PREFATORY.

2. I was in charge throughout the year. The farms at Burdwan, Dumraon, Sripur, Sibpur and Gouripur and the Research station at Dalsinghserai were inspected. I accompanied His Honour the Lieutenant-Governor to Pusa, attended meetings of the Bengal Silk Committee and Bihar Indigo Planters' Association, inspected several veterinary dispensaries and attended the Sonepur and Rajnagar fairs. I also visited Kalimpong, and toured through the jute-growing districts. I was on tour for 184 days, in every month except May and September, but most of my time was occupied in inspection of settlements.

Mr. Debendra Nath Mookerji was Assistant Director throughout the year. Babu Girish Chunder Dutt was my Personal Assistant on the Agricultural side up to 26th August 1903, when he was relieved by Mr. Nitya Gopal Mukerji. The expert staff of the Department included also four travelling overseers.

3. The Phipps' Agricultural Institute at Pusa has been opened by the Government of India during the past year, the buildings are under construction and the farm is being laid out.

In February His Honour the Lieutenant-Governor accompanied by the officers of the Revenue Department of this Government visited Pusa and discussed with Mr. Mollison the relations between the Institute and the Agricultural Department of Bengal. The Institute will include a Research station, an Experimental farm, an Agricultural College and a Cattle-breeding farm. It was decided to close the Bengal Agricultural College at Sibpur as soon as the College at Pusa was opened and to transfer the students to the Pusa College. The Cattle-breeding Farm at Pusa is intended primarily for the benefit of Bengal. The Veterinary Officer in charge will be for all purposes of discipline and control under the Director of the Institute, but the Superintendent, Civil Veterinary Department, Bengal, will select the herd, supervise feeding, breeding, etc., and will choose the young stock for distribution. The Director of Agriculture, Bengal, and the Deputy Director, when appointed, will be permitted to visit the Institute from time to time and to suggest experiments and subjects for research. In Government order No. 2665Agri. of 10th Augus

1903, paragraphs 8 and 9, the general lines for the development of the Department in Bengal have been laid down :—

"It has been pointed out that for the present the work before the Agricultural Department is research, to be combined in due course with the demonstration of results. Proposals for the establishment of a Research station in Bengal, with an Agricultural College and classes attached to it, are now under the consideration of the Government of India. This station, if sanctioned, should, in future, form the nucleus of all research work, and the Deputy Director should keep in constant touch with it and utilise the results obtained by it as much as possible. Round this centre should be grouped the Divisional experimental farms, situated so as to best fit in with the prevailing agricultural characteristics of each Division, manned by minor experts trained at the Research station, and conducted on the strictest possible scientific principles. From research work the Department should proceed to demonstration: the only way to teach the cultivator is to prove to him in practice the financial superiority of the methods which are recommended. When the Department, therefore, has anything to teach, it must demonstrate its knowledge on farms attached to experimental farms or on farms situated in Government or Wards' estates. These again must be supervised by trained agriculturists, and must be inspected by District Agricultural Inspectors, who may, perhaps, combine with their duties of inspection, agricultural and crop enquiries, and the collection of agricultural statistics.

"By adopting such a scheme as this, by working patiently up to it, and by keeping it sufficiently elastic to meet unexpected demands as they arise, it is believed that the Department would gradually be able to effect many practical reforms in present agricultural methods, improve the accuracy of crop returns and statistics, and create a valuable agency which would be of assistance in times of agricultural depression. Such a scheme could be developed either slowly or rapidly, so that it could be proceeded with as funds permitted. Provided that a firm foundation is obtained in accurate expert knowledge at the Research station referred to, and that each experimental station is properly equipped and carefully managed from the first, the Department can wait patiently for results and for the gradual development of methods of demonstration."

4. The post of Deputy Director of Agriculture has not yet been sanctioned. Government has, however, opened a divisional farm at Cuttack during the year to demonstrate the value of irrigation and to carry out the experiments suggested by the Irrigation Commission. A programme for irrigation experiments in all the farms has been drawn up in consultation with Mr. Mollison and the Chief Engineer. Sanction has also been given to the acquisition of land for one divisional farm every year for the future.

The Board of Revenue is now considering proposals for allotment from its improvement grant for Government, and, perhaps, for Wards' estates, to the upkeep of District demonstration farms in which the experiments made at the divisional farms will be tested and adapted to suit local conditions. This portion of the scheme of development must necessarily proceed slowly for want of expert officers to place in charge of the farms. The Inspector-General of Agriculture has, however, already taken two young men from Bengal for training as fieldmen on Rs. 30—50 for two years, and may be induced to take more if they will come without pay. Some four or five agricultural scholars also qualify every year at the Sibpur College, but Bengal does not yet possess an expert staff strong enough to form a training school for agricultural tutors, and it will be some time before Pusa produces a sufficient number of experts for that purpore. I may add, however, that I have received several inquiries for the Pusa College prospectus. In any proposals which may be made for increasing the *cadre* of Sub-Deputy Collectors, I trust that the Travelling overseers and Agricultural students will find a place. By this means students will be attracted and in the course of time a section of the Subordinate Executive Service may be graded according to merit or seniority in the service of the Agricultural Department. An offer of a scholarship to Pusa for the best student at the Dumraon school has been already made by the Rani, and no doubt District Boards will come forward to support promising boys who have attended agricultural classes in their own districts.

Pending sanction of the post of Deputy Director, it is not possible to submit definite proposals for his head-quarters. It is necessary to have the Deputy Director in close touch with an influential and public-spirited Association interested in Agriculture and for many reasons he should be stationed close to Calcutta. The Inspector-General of Agriculture, however, advises that the neighbourhood of Calcutta is not suitable for the farm which it is so necessary to have in close association with the Deputy Director, and further suggests that for such a farm facility for irrigation is a *sine quâ non*. For this reason he

advises a site close to the Sone Canals and having lands commanded by it. The Chief Engineer has been consulted and warmly welcomes the suggestion and promises every facility. A site will be provisionally selected in July. The subject of Agricultural Education is noticed in chapter IV of the report.

CHAPTER II.

SCIENTIFIC AND NATIONAL ENQUIRY UNDER IMPERIAL CONTROL.

5. *Sugarcane disease.*—In November last, Dr. E. J. Butler, M.B., F.L.S., Cryptogamic Botanist to the Government of India, visited the Burdwan and Dumraon farms in connection with the investigation of sugarcane diseases in Bengal and furnished the report which is reproduced *in extenso* in Appendix V.

6. *Dioscorea (yams).*—As the result of investigations on the subject of yams, the Officiating Reporter on Economic Products has issued a note giving the scientific and vernacular names of all the yams known in Bengal and Assam with their distribution as far as ascertained. His request for further specimens and information has been circulated to the District Officers.

7. *Collection of articles for the Indian Museum and the Imperial Institute, London.*—During the year under report a few specimens of various economic products, such as, (1) *Amarantus spinosus*, (2) *Holarrhena antedysentirica*, (3) *Melia azadirachta*, (4) *Symplocos racemosa*, (5) *Rheum emadi*, &c., were collected by this Department through its travelling overseers for the Imperial Institute, London.

8. *Deterioration of jute-fibre.*—Considerable progress in the enquiry was made during the year. According to the opinion expressed by the Secretary, Calcutta Baled Jute Association, the question presents three different aspects. Either the alleged deterioration may be accounted for by impoverished seed, or by drumming the jute in an improperly dried condition, or by fraudulent adulteration with water. For the first two causes the raiyat is to blame, and for the third the middleman. The third indeed is most serious, as the result is a deterioration of strength, colour and gloss of the fibre. The Department was fortunate in obtaining the help of several expert officers. The Inspector-General of Agriculture, the Superintendent of the Royal Botanic Garden, Sibpur, the Reporter on Economic Products, and the Agricultural Chemist have all given valuable advice. The experimental work was conducted at the Burdwan farm, and also at Faridpur and Jalpaiguri. Samples of fibres and of water in which the jute was retted were sent to the Agricultural Chemist for analysis, and opinions of jute experts taken as to the quality and market price of the fibres grown under different conditions as to variety, soil, manuring and steeping. The results of 13 years' experiments has established the fact that the Burdwan farm selected seed generally gives the best results, and that the *Corchorus capsularis* yields a better fibre than *Corchorus olitorius*. The highest yields were obtained at the Burdwan farm from three Dacca varieties, viz., *kajla* (2,560 lbs. of fibre per acre), *agnishwar* (2,540 lbs.) and *belgachi* (2,520 lbs). Serajganj *deswal* jute, which ranks highest in point of quality, yielded only 2,020 lbs. per acre, while the farm selected Serajganj *deswal* yielded 2,480 lbs. The variety experiments are being repeated this year at the above places, and also at Rangpur and Gouripur (Mymensingh).

With regard to fraudulent watering or excessive moisture, very careful inquiries were conducted by Messrs. N. G. and D. N. Mukerji at various jute centres as well as in Calcutta. The inquiries elicited by the Messrs. Mukerji show that hygroscopicity depends upon certain conditions of temperature. It is suggested that any bale found to contain an abnormal percentage of water may be rejected or be bought at a lower price. It was also suggested by the Associations that legislation in the form of the Bombay Act for cotton adulteration might be adopted. Another suggestion was that notices under Government order be fixed up at the principal jute marts, to the effect that drums containing an abnormal percentage of water would be confiscated and the owners prosecuted. This means legislation and putting power in the hands of the police. It is reported, however, that one firm did put up notices at

its markets in which it declared its intention of not buying wet jute, and for a time, in the belief that the notice was issued by Government, watered jute was not brought for sale.

As regards drumming in wet condition, raiyats will be invited to see the drumming of the fibre grown in the experimental centres and will in due course be shown a list of the prices at which these fibres are valued in Calcutta, so that they may compare the prices which they obtain. Very often, however, the middleman is guilty of the fraud.

Major D. Prain, I.M.S., has suggested that in the course of steeping and retting coolies of the districts from which the varieties are imported should be brought down to handle their own varieties, as local coolies do not get equally good results from such as they are unfamiliar with. Dr. J. W. Leather has also suggested for inquiry whether climate or geographical position rather than the character of the soil affects the strength of the jute fibre. Certainly the trade classification favours this view.

A special report on the subject will be submitted to Government.

9. *Jute forecast.*—In connection with the jute forecast it is to be noted that an earnest attempt is being made by the deputation of two travelling overseers during April and May to the jute districts to ascertain the actual area under cultivation. The preliminary forecast is to be postponed till 7th to 15th July and no attempt to ascertain the outturn in bales is to be made. The omission should avert a certain amount of the speculation which has hitherto followed its issue.

10. *Cotton Cultivation.*—Since the disorganisation of the cotton markets of the world planters in Bihar and others have applied for seed of superior kinds. Arrangements were made last year for importing a small quantity of Egyptian, Broach and Goghari cotton seeds. These were distributed among planters and others. The Department is indebted to the Inspector-General of Agriculture in India for the keen interest he has been taking in the development of the cotton-growing industry of Bihar, and for the large quantities of seed he has distributed during the past and present year. He has also cultivated cotton according to the Gujarati methods with the help of trained cattle, at Shahpur Undi and Dalsingh-serai in the Darbhanga district and at Arrowah in the Chapra district. Major D. Prain, I.M.S., has also given great assistance in the study of the botanical characters of the plants grown at the Dumraon and Sripur Experimental Farms. The result obtained from the seeds distributed by the Department last year was, on the whole, discouraging. Experiments were conducted by the Sub-divisional Officers of Gopalganj and Barh, the Superintendent Hazaribagh Reformatory School, the Superintendent of the Cossipur Practical Institution, the District Engineer of Rangpur and some indigo-planters. It is satisfactory to learn that at Barh the raiyats are much impressed with the improved varieties. It must be added, however, that the seeds, especially from Bombay, were all received late, and the scanty rainfall in July was also a cause of failure. Some very fine boles of Garo Hill cotton were grown at Rangpur.

Early arrangements have been made this year for the distribution of a very large quantity of Egyptian, Sea Island American and South Indian cotton seeds. The Inspector-General of Agriculture has promised to send five pairs of trained Gujrati bullocks and expert cotton cultivators to help the Bihar planters and our Dumraon and Sripur farms in sowing and cultivation.

More hopeful results are also expected from the wider cultivation of the Dacca tree cottons and others found close to temples from which the secred thread is made. Some of these fine cottons are still used for textile purposes in Dacca. During the past year the travelling overseers of this Department made a collection of seed from such trees from several districts, and these are being distributed at present, with instructions regarding method of cultivation.

11. *Crude Saltpetre as a manure for Rice and Irrigated Wheat.*—The Inspector-General of Agriculture in India requested this Department in March 1903 to arrange for a series of experiments for demonstrating the value of crude saltpetre as a manure for rice and irrigated wheat in the different districts of this Province. The Collectors of Nadia, Faridpur, Mymensingh, Chittagong, Burdwan, Shahabad, Saran, the 24-Parganas, the Deputy Commissioner of Jalpaiguri and the Subdivisional Officer of Barh helped to conduct

these experiments and the travelling overseers of this Department were sent to advise the raiyats at the time of application of the manure. The saltpetre used was of 60 per cent. purity and was supplied by the Inspector-General. The quantity distributed was about 150 maunds. The experiments were mostly conducted in raiyats' fields, manured and unmanured side by side. The results obtained were conflicting, better produce by the use of saltpetre being obtained only in a few cases, *e.g.*, in Faridpur 6 maunds more per acre of rice and in Katwa (Burdwan) 50 per cent. larger outturn of irrigated wheat. The results show that as yet saltpetre cannot be recommended as a suitable manure for the rice crop in Bengal but will be tried more extensively this year both for rice and for irrigated wheat.

12. *Irrigation Experiments.*—A valuable report by Mr. N. G. Mukerji on crop-cutting experiments in the irrigated area of the Eden canals has been published by the Public Works Department. Inquiries have been made also as to the sufficiency of water-rates in the areas irrigated by the Midnapore, Sone and Eden canals. A recommendation for increase of occupier's rate in respect of all the three canals has been made. Under the orders of the Government of India, a farm has been acquired close to Cuttack to demonstrate the value of irrigation, and a scheme of experiments based on the recommendation of the Irrigation Commission has been drawn up in consultation with the Inspector-General of Agriculture and the Chief Engineer. The experiments will be carried out in the Cuttack, Dumraon and Burdwan farms.

13. *Bengal Veterinary Department—Cattle Breeding.*—The Annual Report of the Civil Veterinary Department, Bengal, will be separately submitted to Government. The only cattle-breeding farm at present is at Sripur in the Hatwa Raj estate under the Court of Wards, but a farm is about to be started at Pusa. Proposals have also been submitted for acclimatization depôts at Sripur, Pusa, Belgachia and other centres. The Queensland Ayrshire herd has been distributed to Bettiah, Bankipore, and Sripur. The Inspector-General, Civil Veterinary Department, has specified a local type of cattle for the Sripur herd, and the policy of the Department is now to improve this type, and not to admit crosses with the Hissar, Montgomery and other heavier breeds.

14. A sum of Rs. 2,500 was again sanctioned by the Government of India for the award of prizes at cattle fairs and should have been distributed as noted in the margin. The total sum, actually awarded, was only Rs. 1,592-14-6 because cattle, true to type and conforming with the strict conditions, were not exhibited in sufficient number. Ten silver medals were received from the Inspector-General of the Civil Veterinary Department, India, of which eight were awarded at the following fairs:—Suri 2, Kalimpong 1, Sitamarhi 2, Sonepur 1 and Rajnagar 2. The Rafiganj and Barahpur fairs were not held this year on account of the outbreak of plague, and the contributions made to these fairs have since been refunded. The money prizes at the Rajnagar Fair, for the Bachour bulls, which are *res nullius*, have this year been given to a local manager for feeding and rearing young bulls.

Fair.			Rs.
Suri	...	...	240
Santrabari	...	...	180
Kalimpong	...	...	450
Sitamarhi	...	...	260
Sonepur	...	...	240
Khagra	...	...	180
Bihta	...	...	180
Rafiganj	...	...	180
Bettiah	...	...	180
Rajnagar	...	...	180
Barahpur	...	...	240
Total		...	2,500

The Superintendent, Civil Veterinary Department, Bengal, has made proposals, which I have submitted to the Inspector-General, for this grant to be distributed in well known breeding centres to actual breeders.

15. *The Veterinary College.*—The College at Belgachia is growing in popularity, and the new admissions are far in excess of the accommodation. Government has sanctioned Rs. 1,50,000 for extension of the premises. The success of the students in the final examinations was very creditable, but they are not sufficient to fill the vacant posts. District Boards and Municipalities might take more interest in the Veterinary dispensaries. These flourish best where the District Officer takes interest in the work, such as Mr. J. G. Cumming and Mr. E. V. Levinge take in Patna and Muzaffarpur respectively. Inoculation against rinderpest has been very successful in many districts and particularly in Noakhali.

CHAPTER III.

SCIENTIFIC AND LOCAL ENQUIRY UNDER PROVINCIAL DIRECTION.

The Government Experimental Farms.

1. SIBPUR FARM.

16. Government actually owns three farms—Sibpur, Chittagong and Cuttack. Of these, the oldest is Sibpur, established in 1887. Generally the season was unfavourable.

(*a*) *Manure experiment* were, as in previous years, conducted without analysis. The crops chosen were rice, ordinary jute and *hibiscus cannabinus*, sugarcane, cabbages, potatoes and country peas.

The results may be summarised as follows :—

Rice.

Manure per acre.	Grain per acre in—			Straw per acre in—		
	1903.	1902.	1901.	1903.	1902.	1901.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
10 maunds castor-cake	1,640	1,715	1,742	2,644	2,827	2,152
1½ maunds saltpetre ...	1,106	1,330	1,476	1,824	3,541	1,501
Unmanured ...	Average 1,279 lbs.			Average 2,438 lbs.		

The average value of the increased yield of the plots manured with castor-cake over the unmanured is about Rs. 12 per acre but the 10 maunds castor-cake costs Rs. 24. The reluctance of cultivators to use manures for rice, except when they are available at almost no cost, is therefore easily understood.

Jute.

	1903.	1902.	1901.	
	Mds. srs.	Mds. srs.	Mds. srs.	
Manured ...	11 13	18 30	21 0	Outturn per acre.
Unmanured ...	5 37½	16 10	19 20	

Mesta-pat (*Hibiscus cannabinus*).

	Mds. srs.	
Manured	12 25	Outturn per acre in 1903 only.
Unmanured	11 10	

The latter crop should be further experimented with. It is said to stand drought better than jute and its fibre commands a higher price. In the case of *sugarcan*, cattle-dung applied at the rate of 300 maunds per acre gave the best result. The *cabbage* experiment was a failure owing to the heavy rainfall last October. In the case of *potatoes*, castor-cake applied at the rate of 20 maunds per acre gave the best result. *Peas* showed the best result from an application of 20 maunds of lime per acre.

(*b*) *Experiments in methods of cultivation.*

Jute.—*Thick and thin sowing.*

Quantity of seed per acre.	1901.	1902.	1903.	Remarks.
	Outturn per acre.	Outturn per acre.	Outturn per acre.	
7 lbs.	1,804	...	...	The outturn is expressed in lbs. of fibre.
7½ „	...	1,435	1,422	
9 „	1,844	...	...	
10 „	...	...	1,482	
12 „	1,742	...	...	
12½ „	...	1,435	...	

The quantity used by the raiyats, *i.e.*, 9 lbs. per acre, or about one and a half seers per bigha, is the right quantity to sow.

(*b*) *Sugarcane.*—Methods of planting—

(i) Bengal.	(iii) Poona.
(ii) Bihar.	(iv) West Indian.

The last gave the best results both this year and last year and seems to show that sufficient space for the canes should be left and that in Lower Bengal they are grown too thick.

Aus paddy.—Mr. N. G. Mukerji made a discovery that the seed of the shoots coming up after the first cutting are highly drought-resisting and prolific. Two years' experiments have corroborated this fact.

The figures actually obtained were:—

	Outturn of grain per acre.	
	1903-1904.	1902-1903.
	Mds. Srs.	Mds. Srs.
Central Provinces fine *aus*, seed of 1st cutting, transplanted ...	8 30	18 0
Ditto, do. 2nd do., do. ...	11 12½	22 0
Ditto, do. 1st do., broadcasted ...	Failed.	Failed.
Ditto, do. 2nd do., do. ...	6 12½	15 10
Peshwari, Swati, do. 1st do., do. ...	Not grown.	Failed.
Ditto, do. 2nd do., transplanted ...	Ditto	20 5

The value of the discovery for this Province is obvious, and the experiment will now be taken up by the other farms that its utility may be tested under different conditions of soil and climate.

(*c*) *Variety experiments.*—*Corchorus capsularis* gave a larger produce than *Corchorus olitorius*, *Java* cane yielded a heavier crop than either *Samsara*, *Khari*, or Chittagong *Patnai*. The Java cane cuttings were kindly supplied by Mr. E. R. Osgood, Superintendent of the Cossipore Sugar Works.

A large variety of crops is also grown at this farm in small patches for demonstration to students of the Agricultural classes of the Civil Engineering College.

(*d*) The only new implement tried at this farm during the year was Hauser's grain cleaner and winnower, which was purchased at a cost of Rs. 250. The Agricultural Lecturer reports very highly on its merits.

(2) *The Chittagong Farm.*

17. Four varieties of sugarcane, three varieties of paddy, *sunn* hemp, two varieties of *arhar*, maize, two varieties of cotton, brinjals, *patal* (Trichosanthes dioica), potatoes, wheat, oats, onion, cabbages and cauliflowers, turnips, peas (English and country), radishes and mustard were grown in the farm during the year under report. Of these, only *patal* and cabbages and cauliflowers may be said to have been successful. They found a ready market in the town of Chittagong and yielded a good profit. The introduction of the *patal* crop is recognised as a benefit by the people and its cultivation is being locally taken up by cultivators and others. Plantains, pine-apples, lichies and other fruit trees were planted and are doing well. The receipts of the farm during the year amounted to Rs. 1,060-11-3 as compared with Rs. 1,223-7-9 in the preceding year. Excluding Rs. 1,045-12-8 for land acquisition charges, the cost has been Rs. 5,668-15-6 during the year. Mr. Luson, Officiating Commissioner of the Chittagong Division, who visited the farm lately, has reported unfavourably on the working of the farm and I shall hold an enquiry next month.

(3) *The Cuttack Farm.*

18. An agricultural farm was started at Cuttack at the end of the year to carry out the suggestions of the Indian Irrigation Commission.

Farms under Wards' Estates.

(*1*) *Sripur Farm, Hathwa Raj Estate.*

19. This farm was established six years ago, and it has been under the direct charge of Mr. N. N. Banerjie, M.R.A.C., for the last three years, during which period it has been developed chiefly as a cattle-breeding farm. During

the year under report 33 acres were under experimental crops, 557 acres under fodder crops for the use of the cattle, and 90 acres under pasture.

The following crops were successful:—Maize, Jaunpur; Jowar, Nilwa, Local, Impee; Sugarcane, Khari; Potato, Amragachi (Patna); Sweet potato, New Jersey.

Foreign varieties of sweet potatoes are much sought after for seed by the local cultivators. Soy-beans and tobacco were not successful.

Silos.—The silage experiments of this farm are of a very hopeful character. Both cut and entire fodder grasses are pitted in *kutcha* and *pucca* pits. One pit with entire stalks has been opened after three months and the silage is being eaten with relish by the cattle.

A change of policy with regard to cattle breeding was introduced during the year, under the advice of the Civil Veterinary Department. The original idea of improving the local breed of cattle by crossing them with superior up-country and foreign breeds, was abandoned and it was decided to improve the local breed by continuous selection, good feeding and proper housing. The Montgomery breed of cattle from the Punjab is, however, still being maintained in the farm with very satisfactory result as to their milking quality and is highly admired by the native cultivators of the estate and by European planters of the district. One bull calf, one heifer and one cow-calf of the Queensland Ayrshire breed are also said to be doing well. Breeding of buffaloes and goats is also carried on in the farm.

Unfortunately the farm bungalow was destroyed by fire last December, and the dairy machines were either destroyed or damaged on this occasion.

Of the agricultural implements used and found beneficial may be mentioned the following:—The Sibpur plough, Howard's cotton D plough (supplied by Messrs. T. E. Thomson & Co. for Rs. 40), the *bakhar*, a maize huller supplied by Messrs. T. E. Thomson & Co. for Rs. 100, and an iron seed-bin made locally at a cost of Rs. 13.

(2) *The Tikari Home Farm.*

20. The Home Farm was managed by a graduate of the Saidapet College who unfortunately died last March. The total area of the farm is about 30 acres, out of which 15 acres are cultivated, 4 acres occupied by sites of buildings and roads, and the rest is pasture land. The land under cultivation is divided into 14 plots, some of them were manured with cowdung, some with cowdung and night-soil, and some left unmanured. Coriander, mustard, peas, maize, sugarcane, tobacco, white gram, linseed and oats were cultivated during the year. Maize, sugarcane and tobacco yielded satisfactory results. The dairy attached to the farm contains 7 she-buffaloes which were in milk for the first six months. Of the eleven calves of these animals, seven are kept in the mufassal and four in the farm. The working of the dairy was satisfactory.

After ascertaining that the present proprietor will not keep on the farm on his assuming charge of the estate, the Board have ordered the closing of the Tikari Home Farm after the 31st March 1904.

Private Farms worked under the control of this Department.

(1) *Burdwan Farm.*

21. *Area.*—31 acres, of which about one-half was under experiment, the other half being under roads, buildings, water-channels and non-experimental cultivation.

Rainfall—53·78 inches. The normal rainfall is 55 inches.

I. Manure experiments.—The scheme was generally to apply a definite quantity of nitrogen per acre in various forms. The amount of manure per acre was determined by the percentage of nitrogen ascertained by analysis.

(*a*) *Paddy.*—Three sets of manure experiments were continued with this crop. In the first set, which has been going on since 1891-92, the quantities of the different manures are applied empirically, *i.e.*, without any reference to their composition. In the second series (started in 1897-98) the scheme is to apply 50 lbs. of nitrogen per acre. In the third series the effects of green manuring *versus* cowdung are being investigated. This series was started in 1895-96 with jute only ploughed in for green manuring. Two plots under *sunn* hemp (*Crotolaria juncia*) and *dhaincha* (*Sesbania aculeata*) have been added to the series.

The most important results obtained during the year under report are shown in the table below :—

Series.	Quantity of manure.	Outturn of unhusked grain per acre in lbs.	Profit per acre. Rs.	A.	Cost of manuring. Rs.	A.	Remarks.
1st series ... (amounts of manure empirically chosen).	Bonemeal 3 maunds, Saltpetre 30 seers	4,298	112	0	7	8	Uniformly highest result.
	Bonemeal 6 maunds	4,116	78	12	9	0	
	Do. 3 „	3,850	76	4	4	8	
	Cowdung 100 „	3,930	79	0	4	0	
	Do. 50 „	2,950	50	13	2	0	
	Unmanured	1,483	8	8	...		Average of three plots.
2nd series ... (50 lbs. nitrogen per acre).	Bonemeal 10 „, Saltpetre 3 „	3,545	43	13	29	12	Ditto.
	Bonemeal 10 „	3,915	73	6	14	8	30 lbs. nitrogen in the manure.
	Saltpetre 7¾ „	3,120	22	0	38	11	
3rd series ... (green manuring *versus* cowdung).	Jute ploughed in	3,125	53	4	5	11	Cost of extra labour for green manuring.
	Sunn hemp „	2,611	38	0	7	14	
	Dhaincha „	2,975	50	14	5	11	
	Cowdung 50 maunds	2,481	37	5	2	0	
	Unmanured	1,739	18	8	...		

It appears that a large quantity of saltpetre applied to paddy does not give a correspondingly high outturn. This corroborates last year's experience. It is remarkable that green manuring gave better results than cowdung. This experiment may be useful to raiyats where cowdung is scarce. The plot green manured with jute was, as mentioned above, an old plot and hence probably gave the best result, but *dhaincha* is almost an ideal plant for the purpose.

(*b*) *Jute.*—Scheme 30 lbs. nitrogen per acre :—

Quantity of manure per acre.	Outturn of fibre per acre in lbs.	Net profit per acre. Rs.	A.	Cost of manuring. Rs.	A.
Cowdung 55 maunds ...	2,733	57	10	2	3
Castor-cake 5½ „ ...	2,506	35	6	10	10
Bonemeal 10 „ ...	2,117	7	5	15	0
Bonemeal 5 „ ..., Saltpetre 2¼ „ ...	2,238	10	4	19	6
No manure	2,022	16	8	...	

(*c*) *Sugarcane.*—Scheme 150 lbs. nitrogen per acre :—

A mixture of bonemeal and saltpetre gave the highest outturn of *gur* per acre (6,564 lbs.), castor-cake proved better than rape-cake (6,180 and 5,664 lbs. of *gur* respectively). Castor-cake or rape-cake with cowdung or saltpetre gave a slightly higher outturn than when used alone. Cowdung by itself gave the lowest outturn (4,746 lbs. of *gur*).

(*d*) *Potatoes.*—(Scheme 100 lbs. nitrogen per acre.) One hundred and eighty maunds of the farm pitted dung was found on analysis to be equivalent to, so far as nitrogen went, nearly 300 maunds of cattle manure bought of the raiyats. Yet the farm manure gave a higher yield than the raiyats' manure, showing that the nitrogen in the former was in a more readily available form than in the latter. As in the previous year the addition of saltpetre to the oil-cakes or bone made very little difference. Castor-cake by itself again gave the highest outturn.

The green manuring experiment was continued with and without the addition of other manures. The plant chosen for green manuring was *dhaincha* (*Sesbania aculeata*). The following results were obtained :—

	Outturn. Mds.
Green manuring alone	136
Ditto and cowdung, 90 maunds	197
Ditto „ castor-cake 12 „	173
Ditto „ bonemeal 10 „	166

II.—Experiments in Methods of Cultivation.—(*a*) *Paddy.*—Thick broadcast sowing of seed (60 lbs. per acre) gave an outturn of 1,641 lbs. against 2,016 lbs. obtained from thin sowing (30 lbs. per acre).

In the spacing experiments in transplanting paddy seedlings the following results were obtained:—

Distance apart in planting seedlings (each way).	Outturn of grain per acre in lbs.	Net profit per acre.
		Rs. A.
6″	... 2,016	19 2
9″ (usual way with local raiyats)	... 2,394	33 4
12″	... 2,954	47 4

In both the above experiments the crop was manured with cowdung (92 maunds containing 50 lbs. of nitrogen per acre).

(*b*) In *sugarcane* (1) the Bengal system, (2) the Poona system, and, (3) the trench system lately adoped by some of the Bihar planters gave about equal results.

(*c*) The planting of whole tubers *versus* cut sets for *potatoes* showed that the outturns were almost directly proportional to the quantities of sets or whole tubers planted per acre.

(*d*) The spacing experiment with *jute* gave conflicting results. The experiment will be repeated.

III.—Experiments with new crops and new varieties of existing crops.—(*a*) Seven varieties of rice were compared with the following results:—

Names of varieties of rice.	Outturn.	Net profit.
	lbs.	Rs. A.
Peshwar	861	27 7
Amba mohor of Bombay	2,030	22 7
Sukhavel ditto	2,219	32 14
Kamod ditto	2,359	32 10
Balam of Bengal	1,855	28 7
Badshabhog ditto	2,366	46 14
Dadkhani ditto	2,240	43 3

(*b*) Forty-five different races of jute gathered from the most important jute districts of Bengal were grown side by side. No definite conclusions can be formed except that the Burdwan selected seed did very well.

The Board of Scientific Advice, including Mr. Burkill Mr. Mollison and Major Prain, I.M.S., are enquiring into the subject of cross fertilization.

(*c*) Five different varieties of *potatoes* were tried as in the previous year. Patna and Nainital again gave the best outturns (223 maunds and 226 maunds respectively). The failures were Bettiah and Colgong.

It is proposed to open here next year a manure and selected seed and implement depôt.

(*2*) *Dumraon Experimental Farm.*

22. *Area*—30 acres, of which 22 acres were under experimental cultivation.

The monsoon was very late in breaking and the seedlings of winter rice could not be transplanted till the beginning of August.

I.—Manure experiments.—As at Burdwan the scheme was to supply a definite quantity of nitrogen for each crop in different forms. Samples of the various manures were in every instance analysed by the Agricultural Chemist to the Government of India before they were applied to the crops.

(*a*) *Rice.*—40 lbs. nitrogen per acre. Cattle-dung alone and a mixture of cattle-dung and castor-cake gave very nearly the same result (2,150 and 2,100 lbs. of grain per acre respectively). Saltpetre gave very much the same outturn as in the previous year (1,810 lbs. against 1,820 lbs.). The unmanured plot gave only 1,000 lbs. The apparent anomaly of the ashes of cowdung giving as good a result as the whole dung was again repeated during the year under report.

(*b*) *Wheat.*—40 lbs. nitrogen per acre. Poudrette again gave the highest outturn (1,515 lbs. per acre) as in the previous year. Castor-cake and rape-cake came next with 1,400 and 1,375 lbs. per acre. Green manuring with *sunn* hemp proved superior (955 lbs.) to that with indigo, *kulthi* and *mung*.

(*c*) *Sugarcane.*—150 lbs. nitrogen per acre. The crop was seriously damaged by white-ants and cane-borers so that the outturns of the different plots were not comparable.

II.—Experiments in methods of cultivation.—*Khari* sugarcane was planted (as at Burdwan) according to three different systems, *e.g.* (1) the local system,

(2) the trench system of the Bihar planters, and (3) the Poona system. The outturn of *chakrī* or hard *gur* in the three systems were 2,865, 3,405, and 3,600 lbs. per acre.

III.—Experiments with new varieties of crops.—(*a*) *Rice.*—Three Bombay varieties were compared with three local varieties with the following result:—

				lbs.	
Kumode (Bombay)	...	...	...	1,270	per acre.
Sukhavel („)	...	...	...	1,650	„
Srikole („)	...	...	...	1,220	„
Maharajwa (local)	...	...	...	2,000	„
Shelea („)	...	...	...	1,400	„
Bataspheni („)	...	...	...	1,210	„

(*b*) *Sugarcane.*—Three Bombay varieties were compared with the local variety named *mongo* with the following result:—

			lbs.	
Hullu Cabu (Bombay)	...	...	3,915	hard gur per acre.
Beta „ („)	...	...	2,565	„
Sanna Bille („)	...	...	4,563	„
Mongo (local)	...	...	3,213	„

Besides the above there were a number of soft varieties of canes, *e.g.*, *samsara*, white and red Mauritius, Poona, &c., but they were seriously damaged by white-ants and cane-borers.

(*c*) *Wheat.*—A number of varieties were grown on small strips of land. Of these two varieties of Australian wheat, one variety of cross-bred Australian, also Muzaffarnagar wheat, Sindhi wheat and Palestine wheat gave the best promise.

(*d*) *Oats.*—While Australian wheats were found so suitable, Australian oats failed altogether. Canadian Welcome oats, however, did very well.

Besides the foregoing there were various other crops including some ninety varieties of cotton. The last were grown from the shoots of the preceding year's crop and included a number of American varieties. These American varieties did not bear well the first year, but the *ratooned* crop did much better.

Balance sheet.—The total receipts amounted to Rs. 950 and the total expenditure to Rs. 2,544, against Rs. 714 and Rs. 2,588 of the preceding year.

Agricultural Experiments in Government and Wards' Estates.

23. The Board are discussing proposals with Commissioners for setting aside a percentage of collections for agricultural experiments proper. At present the improvement grant contains headings;—Miscellaneous, Sanitary and Agricultural.

24. From the summary of the Divisional reports given below, it will be seen that the experiments conducted through the raiyats of Government and Wards' estates and other private individuals gave, on the whole, unsatisfactory results. In a few cases where the experiments were conducted under the personal supervision of District Officers or other responsible persons, good results were obtained. The crops that seem to have given good result almost everywhere are the Patna variety of potatoes, the *samsara* and *khari* sugarcanes, a fine *aus* paddy originally obtained from the Central Provinces, Muzaffarnagar wheat, and the groundnut. Until the expert direction is stronger, we can aim at demonstration of the value of certain new crops or new varieties of old crops which have been successfully grown in our farms and elsewhere. Proposals are also under consideration for District Associations for the purpose of making known successful experiments.

Burdwan Division.

25. *Midnapore.*—In the Majnamutha estate potatoes were a failure, and peas, brinjals and English vegetables were tried in the Nayagram Ward's estate in this district.

Presidency Division.

26. *24-Parganas.*—Tobacco and *khari* sugarcane were successfully cultivated in the Government estate of Port Canning. In the Diamond Harbour subdivision experiments with potato and sugarcane were conducted with indifferent results in each case.

Murshidabad.—Patna and Nainital potatoes were cultivated in Government khas mahal lands, but the result was not satisfactory. Sixty maunds of seed potato were supplied gratis by this Department to two European managers of zamindaris (Messrs. Macdonell and Keogh). Mr. Macdonell was entrusted with 50 maunds. The reason assigned by him for the indifferent result obtained is that the land chosen by him for this experiment was not suitable, as a *nullah* drained the soil of more moisture than could be supplied by irrigation. Mr. Keogh sowed a part of the seed supplied to him in his factory compound where indigo refuse had long been stacked and this required no other manuring. The yield of the crop in this plot was highly satisfactory, but his experiments in other plots was not equally good. No agricultural experiments were undertaken in the districts of Jessore, Khulna and Nadia.

Babu Romesh Chundra Sircar, an ex-student of the Agricultural class at Sibpur, at present employed as Superintendent of Gardens of the Nawab Bahadur of Murshidabad, introduced the rearing of lac, and cultivation of tapioca and coffee in the Nawab Bahadur's gardens at Murshidabad.

Rajshahi Division.

27. *Rajshahi.*.—The experiments with oats, wheat and peas are reported to have failed. This was partly due to the lands not being properly selected for the purpose. It is reported that the soil of the Terai is not suitable for wheat cultivation, but peas might do well, and it is therefore desirable to introduce the cultivation of this crop in this khas mahal. The cultivation of Patna variety of potatoes has now been introduced in the Jaipur Government estate in the district of *Bogra* after several years' experiment and has proved a complete success. Cooch Behar tobacco has also been partially introduced in this estate, but the people need a training in its cultivation. *Samsara* sugarcane was also cultivated with success during the year in some parts of the estate. Thirteen Siri bulls have been kept by Government in the khas mahals of the district of *Darjeeling* at convenient and central places for improving the breed of cattle. Two bulls were also kept for this purpose in the Government estate in *Pabna*, one of which died last July.

Dinajpur.—In the Maldwar Ward's estate the experimental cultivation of Patna potato and Muzaffarnagar wheat made during the year proved successful. In the Churamon estate *bhadoi* paddy, Ambala potato and Muzaffarnagar wheat were grown. The outturn is reported to have been good. A mixture of bonemeal and castor-cake was found to be the best manure for potatoes and wheat, while cowdung and green manure with a mixture of bonemeal proved the best for paddy.

Dacca Division.

28. *Dacca.*—The only agricultural experiment tried was the unsuccessful cultivation of potatoes in the Government estate Char Bachamara in the subdivision of Manikganj.

Faridpur.—Patna and Nainital potatoes were tried, the outturn of Patna potatoes was very good, but that of Nainital was not satisfactory. This year the result of the experiment with *samsara* and Bombay sugarcanes was satisfactory, and the Collector reports that the increasing demand of the neighbouring cultivators for the cuttings shows undoubtedly that the cultivation of sugarcane will soon spread. Calcutta brinjal, radish, *ôl* and *kachu* yielded a good outturn. Experiments in the cultivation of different varieties of jute were carried on in private estates close to the head-quarters under the direct supervision of this Department.

Backergunge.—Nainital potato seeds and some seeds of English vegetables were distributed among some of the tenants of the two Government estates—Tushkhali and Hesamuddin—at a reduced price with the object of encouraging cultivation of these crops. The outturn of potato was, on the whole, satisfactory, but the cultivation of English vegetables failed, owing to heavy rain at the end of October. Various indigenous seeds were tried in the Dakhin Shahbazpur ward's estate at a total cost of Rs. 535. The results of the experiments were moderately successful. The question of starting a central farm near the head-quarters of the district is under consideration.

Chittagong Division.

29. *Chittagong.*—In the several wards' estates the cultivation of sugarcane, chilly and English vegetables was tried on a small scale. Of these,

sugarcane gave a good outturn, but the English vegetables were damaged everywhere by the unusually heavy downpour in October.

Noakhali.—The Collector reports that the experiments made at the Sadar station and at Badur in the cultivation of potatoes, gram, peas and oats have proved a failure. In the previous year also the experiments in these crops were unsuccessful. The local officers are of opinion that the land is not suitable for such crops. The Central Provinces fine *aus* paddy and fine *aman* paddy were successfully grown in the wards' estates of Bharat Chunder Shaha and Girindra Kumar Mozumdar. *Khesari* also yielded a good outturn in the former estate.

PATNA DIVISION.

30. No agricultural experiments were undertaken in the wards' estates in the districts of Patna and Shahabad. The agricultural experiments conducted in the Tikari home farm in Gaya and in the Sripur farm in Saran have been noticed separately in this report.

The Bettiah estate in Champaran made some small experiments with hill potatoes after applying some chemical manure to the land, but the result was disappointing. Oats were tried on a virgin soil, and the result was fairly satisfactory. Wheat, *arhar*, maize and paddy weretried on the Barwat *zerat*, of which maize and paddy gave the best results.

In the Narhan Ward's estate in the district of Darbhanga, experiments were made during the year under notice with the improved varieties of the staple crops grown by the raiyats of the estate, and for this purpose seeds of Muzaffarnagar wheat, Dumraon gram and oats and Nainital potato were obtained through this Department and cultivated in several places of the estate. The surplus seeds were distributed for cultivation among the principal raiyats. The outturn of the wheat, gram and oats was not satisfactory owing to the early cessation of the rains and the consequent insufficiency of moisture in the soil. A special experiment with the Nainital potatoes was undertaken in a village appertaining to this estate. About 2 maunds of seeds were put under sand containing moisture, and when they sprouted, they were taken out and cut in pieces containing two or three buds each according to the size of the tubers and placed on prepared beds about 4 inches apart and 18 inches between the lines, and they were covered over with earth by hand. When the plants made their appearance, the fields were watered, and when they were about 6 inches high, they were earthed up on two sides to a height of about 4 inches. They were then watered according to requirement. The plot which was manured with castor-cake gave the best result. *Samsara* and *khari* sugarcane cuttings were distributed among the principal raiyats for cultivation, but the result was disappointing.

BHAGALPUR DIVISION AND THE SONTHAL PARGANAS.

31. *Bhagalpur.*—In this district, Nainital potato, radish, *palval*, *masoor*, *sonamoong*, *maskalai* and chilly were cultivated in the Madhipura subdivision, but, owing to late sowing, the experiments in potato, *palval*, radishes, chillies, *moong* and *maskalai* did not prove satisfactory. Thep potato plants were mostly destroyed by white-ants. The Bengal variety of sugarcane has been found profitable on experiment by Mr. Christian of Pathurghat factory.

In the Lugma Ward's estate, experiments were made with Bengal and local sugarcane, *baktulsi* and *dudkhani* paddy, *duahi* wheat and oats. The paddy seedlings as soon as transplanted suffered a good deal from floods in the Kosi river. The sugarcane gave a fair outturn. The yield of the other crops was not very encouraging.

Malda.—Although the result of the experimental cultivation of potato in a village in the khas mahal and in the jail garden was not financially a success, the Collector is of opinion that this crop can be profitably grown in the district, and there is some prospect of the tuber being cultivated by a few gentlemen who have taken to gardening and later on by ordinary market gardeners.

Sonthal Parganas.—In the Damin-i-koh Government Estate in this district, experiments were made with groundnuts, agave and oats. The groundnut experiment in this estate is of special interest, as the seed (2 maunds) was distributed among raiyats who considered a portion of their holdings having been rendered unfit for cultivation by sand-drifts from hills. The groundnut crop grown in the fields so spoilt for rice and other ordinary crops has turned

out very successful. *Fourcroya gigantia* was substituted for the ordinary agave *lurida* in the Dumka jail. This experiment promises well. The oats failed completely. In the Sankara Ward's estate, Patna potatoes were succesfully grown.

Purnea.—In the Khagra ward's estate *janera*, oats, wheat, barley and gram were cultivated. *Janera* yielded a bumper crop. The seeds of the other crops failed to germinate properly, owing to excess of moisture in the soil and to the land not being properly prepared and manured. The Nellore bull which has improved much in health is now serving many cows. About 25 calves were the result of the breeding during the year under report. A young bull has been kept for breeding purposes.

ORISSA DIVISION.

32. *Balasore.*—Four maunds of potato seeds were distributed among selected raiyats in the Nuanund estate who cultivated them at their own cost.

Angul.—New experiments were made with potatoes of the Nanital, Patna and Bettiah varieties and with safflower. All were successful except Bettiah potatoes. Sugarcane failed totally for want of irrigation.

Puri.—Potatoes, onions, mustard, sugarcane, wheat, &c., were tried in the gardens of Khurda, Kothdes, and Balukhand Government estates. In Khurda some potatoes and onions were distributed among the leading raiyats and sarbarahkars, and the cultivation by them is reported to have been successful. Sugarcane grown in the Government garden was remarkably successful. In the Balukhand garden potatoes, country and English vegetables were tried, but the result was not generally satisfactory.

Cuttack.—In the Banki Government estate, Patna potato and *samsara* sugarcane were grown, but the outturn was poor.

33. *Tributary States of Orissa.*—In the farm established by the Dhenkanal State, a larger number of crops than in former years was experimented with. Of these, the outturn of sugarcane, onion and potatoes was good. Paddy sustained damage by heavy rain while in flower, and the other crops were damaged by a hailstorm in the early part of March last. The cultivators of this State appreciate the value of the Behia sugarcane mill and evaporating pan and they take out on hire the State mills.

In the Pal Lahara State, Patna and Nanital potatoes were tried. The Patna seeds grew well and yielded a good outturn, but the Nanital variety failed owing to heavy rains. The produce of different varieties of maize, English vegetables and onions were superior in quality. Country sugarcane was grown with success.

The crops experimented with during the year under report in the Baramba State were *samsara* and Saharanpore canes and safflower. The sugarcane crop was very successful. Sugarcane cuttings were also distributed to selected raiyats. Behia sugarcane mill and evaporating pan are much appreciated by the people and the demand is increasing.

In the Keonjhar State a trained sericulturist has been appointed to look after the improvement of sericulture. He planted mulberry. Cocoon rearing will be commenced shortly.

The Maharaja of Mourbhanj is taking a lively interest in the improvement of agriculture and other industries allied to agriculture among his tenantry. He has employed a trained agent who has succeeded in establishing mulberry plantations and cocoon rearing and reeling at Baripada in less than a year's time, also small plantations of the rhea, the cassava, Dacca tree cotton, Peshwari paddy, Guinea grass and superior varieties of sugarcane. The farm at present consists of 4 acres of Bengal mulberry, a nursery for European mulberry trees, and 15 acres of the agricultural crops mentioned. Agriculture and sericulture will be taught in the State schools and a primer is under preparation for this purpose.

CHOTA NAGPUR DIVISION.

34. *Ranchi.*—Nainital and Patna potato seeds were distributed to some raiyats of the Government Estates for experimental cultivation. It was successful only in a few cases, where the crop was cultivated with care.

Palamau.—In the Government estates groundnut, Surat cotton and English vegetables were cultivated. Groundnut and English vegetables gave good outturns, but the yield of the Surat cotton was much below the average.

Singhbhum.—Maize, sugarcane, potato and tobacco were tried in the Government estates. The result was, on the whole, fair. The first three crops have been kept in stock for seed.

In the several Wards' and Encumbered Estates in this Division, potato, maize, barley, wheat, peas and English vegetables were tried, but the results do not appear to have been satisfactory.

Agricultural Experiments by Private Individuals.

35. Of the private individuals who worked successfully for the improvement of agriculture in this Province, the names of Babu Brajendro Kishore Chowdhary, zamindar of Gouripur in Mymensingh; Babu Ashutosh Lahiri, District Engineer, Rangpur; Babu Purnendu Narain Sing, Government Pleader, Bankipur, and Babu Charu Krishna Mozumdar, zamindar of Islampur in Murshidabad, may be specially mentioned. These gentlemen have their own private farms and have great influence with raiyats. They have introduced new staples and are trying to improve the local staples by the selection of seed and the application of proper manure. I inspected the farms of the first two gentlemen, and I am statisfied that the lines they have adopted are excellent. My expert staff is in constant touch with them and there is every reason to hope that other zamindars of Bengal follow their good example.

A table summarising the results of experiments on sugarcane conducted in some of the indigo concerns in Bihar during the year is given in Appendix VI.

36. *Trial of Improved Agricultural Implements in Government, Wards' and Private Estates.*—During the year under report iron sugarcane mills, evaporating pans and Sibpur ploughs were distributed through the agency of this Department. Demonstrations of both agricultural and of dairy implements were also made at the shows. A list of the new and improved implements that were tried in Bengal during the year is given in Appendix I.

37. *Supply of seeds and Manures.*—A list of the seeds and manures distributed by the Department during the year under report (exclusive of those used in experimental farms) is given in Appendix II. This is one of the most important items of work of travelling overseers and occupies a great deal of their time.

38. *Crop-cutting Experiments by District Officers and Settlement Officers.*—It is proposed that next year the Director of Land Records shall associate himself with Engineers in the canal-irrigated areas and jointly conduct experiments on irrigated and unirrigated areas.

The results of the crop-cutting experiments carried out in the districts of these Provinces during the year 1903-1904 have been received and compiled in my office and will be fully analysed and discussed when submitting the next quinquennial return. Three hundred and twenty-two experiments on irrigated crops and 1,204 on unirrigated were made, but the results are most conflicting.

The returns of District Officers in regard to the outturn of crops show that much more attention should be paid to crop cutting-experiments, *e.g.*, one officer returned 484 lbs. of cleaned cotton per acre as the average yield, and within a few months reduced it to 41 lbs. I suggest that Junior Civilians at head-quarters might be employed in the cold weather to supervise these experiments. They will learn the value of the outturn of each crop for their own district and they will keep a check on the weighments, etc., of the subordinates appointed to conduct the actual experiments.

39. *Utilisation of night-soil as manure.*—The trenching grounds of the Suburban Municipalities which were visited last year by a travelling overseer of this Department were partly let out to the cultivators where there was a demand for it. The Sanitary Board have asked the Garden Reach Municipality to start a septic tank. The Meagher system of trenching was tried in the Budge-Budge Municipality, but the experiment, it is reported, was not very successful.

Locusts and other Insect-pests.

40. (*1*) *Locusts.*—Flights of locusts were seen within the jurisdiction of sadar thana of the Jalpaiguri district, in the Begusarai subdivision of Monghyr, in parts of Madhipura subdivision of Bhagalpur, in the Sadar and Deoghur subdivisions of the Sonthal Parganas, in the district of Muzaffarpur, in the district of Birbhum, and in parts of the districts of Hazaribagh, Palamau and

Manbhum. In the district of Muzaffarpur and in the Begusarai subdivision of Monghyr they caused damage to the indigo crop, and in other places the standing crops were only slightly damaged. No serious injury is reported from any place.

(2) *Other Insect-pests.*—Some insects appeared in the Sadar and Jajpur subdivisions of the district of Cuttack and did very slight damage to the *rabi* crops and *dalua* paddy. Specimens were sent to the Government Entomologist at Surat. I have communicated to the local officers the remedies suggested by the Entomologist. Specimens of some insect-pests which was damaging the winter rice crop in the Alipur Tahsil of the Jalpaiguri district were sent to the Entomologist at the Indian Museum, but the parcel was mislaid at the Museum and did not reach him.

A kind of insect-pest locally known as *tâh* injured the mustard crop in the *Binda* Diara in the district of Monghyr. In Palamau the damage done by insect-pest to the *rabi* crops was considerable. It necessitated the entire resowing of the affected tracts. In the Satkania circle in the district of Chittagong about two annas of the crops are reported to have been destroyed by insects locally called "*ledu.*" Insect-pests are reported to have slightly injured some *rabi* crops in the district of Burdwan and the paddy crop in Midnapore.

41. *Sericulture.*—The sericultural operations under the Bengal Silk Committee continued to make satisfactory progress during the year.

The Committee employed overseers and sub-overseers as follows:—

	Overseers.	Sub-Overseers.
Birbhum	...	2
Bogra	1	2
Malda	1	3
Murshidabad	1	3
Rajshahi	...	2

They have popularised the use of healthy seed and helped to stimulate mulberry plantations. The Committee with the help of Government now maintain three model nurseries which showed profits of Rs. 161, Rs. 264, and Rs. 52 respectively during the year and are about to open one in Rajshahi. The secret of a profitable nursery lies in having a sufficient mulberry plantation attached. The Committee also sell microscopes and other appliances to cocoon-rearers. Government has already established a model nursery in the Rajdharpur Government estate in Murshidabad and intends to establish one at Panchanandpur in Malda, and another at Benidaspur in Murshidabad.

The Committee expended Rs. 14,258 including the Government grant of Rs. 6,000 during the year.

A notice of the Rajshahi Sericultural School will be found in paragraph 44.

CHAPTER IV.

EDUCATION IN AGRICULTURE AND SERICULTURE.

42. *Agricultural class at Sibpur.*—Of the six students in the second year, four passed out in the final examination, the other two were special students and both failed. The course appears to be too stiff for special students who have generally little or no previous knowledge of science and fail in such subjects as Chemistry. Of the four students who passed two have obtained appointments in the Executive Service in Bengal and one in Assam. The fourth student has obtained employment in the Bengal Educational Service. It has been decided to keep up the classes until the Pusa College is opened, *i.e.*, at any rate for another year and probably longer. The supply of qualified scholars is not equal to the demand for their services.

43. *Agricultural education in schools.*—The results of the work of the first year of this course in the schools are as follows:—

Gaya.—At the Zilla School all except the highest and lowest classes attended lectures in agriculture. Some 73 boys have garden plots of their own in the school compound.

Dumraon.—At the High School only the first and second class attend, as the lower boys cannot understand lectures in English. It is reported that the lecturer cannot make himself intelligible in Hindi, and that the boys have no text-books. The students go once a week to the experimental farm, and many

do manual labour. A garden for the boys is being laid out close to the school.

Chittagong.—At the Collegiate school only 23 out of 188 boys attend the agricultural classes and the farm is three miles off, so they rarely go there. The Farm Overseer who is the lecturer has not time to teach and to do his work. A museum for seeds, manures, &c., has been opened at the school.

Howrah.—At the Zillah School the first four classes read agriculture, but the farm (Sibpur) is four miles off and it is proposed to make the subject only voluntary.

Burdwan.—At the Municipal School, Agriculture is taught to 50 boys, but the school is three miles off the farm and only the boys of the 1st and 2nd classes were taken for practical instruction free of charge. There is no doubt that much remains to be done, especially in the way of vernacular instruction in Agriculture. Already in the Central Provinces the uses of the village records and the relations of landlord and tenant as well as rudimentary education in agriculture are taught in the *patsalas* and here in Bengal, as soon as the guru-training schools have turned out qualified teachers, there seems no reason why, at any rate in cadastrally surveyed districts, copies of the village maps and khasra and samples of zamindars' accounts and receipts should not be served out to each *guru* and be prescribed for instruction.

44. *Rajshahi Diamond Jubilee Industrial School.*—This school continued to have two separate branches during the year, viz., the Sericultural and the Technical, with two separate Committees of management. The Deputy Inspector of Schools, Rajshahi, was the Secretary of the Sericultural branch, and the Principal of the Rajshahi College of the Technical branch. The District Board of Rajshahi made a grant of Rs. 600 to each branch of the school, and this Department a grant of Rs. 500 to the Sericultural branch. The pupils of the Sericultural branch were all scholarship-holders. The course of the Sericultural branch extending over six months only, two sets of pupils passed out during the year, 8 passing out in June and 9 in December. Of the former, one was employed in the Mourbhanj State, and of the latter one under the Bengal Silk Committee. Two older students got employment during the year under the Assam Government. The Head-master of the School was deputed last January to Mr. Tata's Silk Farm at Bangalore, where unfortunately he died of plague. There has been some difficulty about securing a competent Head-master. The total expenditure incurred by the school, exclusive of the pay and travelling allowance of the Head-master which were met from the funds of this Department, came to Rs. 3,682. The sum of Rs. 990-14 was realised on account of sale-proceeds of cocoons and cloths turned out by the two branches, the sale-proceeds of cocoons reared by the students coming up to Rs. 384-14. The European cocoons were again reared successfully from seed obtained from the Sericultural laboratory of Padua (Italy).

45. *Seri-Agricultural School of Sabong, Midnapore.*—This school is the outcome of a local effort and of a desire to revive the silk industry of the neighbourhood as well as to improve the agricultural condition of the people generally by affording them means of instruction in agriculture and particularly in sericulture. About Rs. 1,300 were raised by the people themselves. The District Board of Midnapore guaranteed the aid of Rs. 30 per month for two years, and a School Committee was formed consisting of the leading Hindu and Muhamamdan gentlemen of Pingla and Sabong. A microscope and a Sibpur plough have been given to this school free of cost by this Department and other special appliances and agricultural seeds have been bought out of the school funds. The lands in the neighbourhood of the village school-house have been given free of cost for agricultural experiments. Potatoes, tobacco and some English vegetables were grown last year. From half a *katta* of potatoes, two maunds of produce were obtained. Three of the cultivators were also given potato seed and they had successful crops. Potatoes never having been grown in this locality before, the school may be said to have done a good work in introducing this crop which has greatly taken the fancy of the cultivators. The first examination will be held in June 1904. It was difficult to find a teacher competent to teach both agriculture and sericulture for the salary offered, but the teacher recommended by this Department is reported by the Secretary to be "taking great interest in making the institution a success."

CHAPTER V.

Publication of Agricultural Information.

46. A monograph on "Tanning and working in leather in the Province of Bengal" by Mr. Rowland N. L. Chandra, late Personal Assistant to the Director of Land Records, was published during the year.

The usual preliminary and final forecasts on the various staple crops of the Province were published regularly during the year. The Agricultural statistics of the previous year and the statistics of minerals and gems were also compiled and published. The prescribed consolidated table showing the average prices of food-grains, &c., in Bengal during 1902-1903 was prepared and issued. A season and crop report for the year 1902-1903 was also published.

CHAPTER VI.

FINAL.

47. *Emigration to Burma.*—The number of State emigrants carried from Bihar to Burma during the year under report was 457 (367 adults and 90 children), against 797 in the previous year. The great falling off in the number of emigrants year after year is attributed to the virulence of the plague in the Bihar districts generally.

The emigrants are carried to Burma at reduced rates by the British India Steam Navigation Company, and one-third of the passage-money is paid as a subsidy in equal shares by the Governments of Bengal and Burma.

48. *Agricultural Exhibitions.*—Fifteen agricultural exhibitions and fairs, at which officers of the Department showed exhibits and made demonstrations, were held, and Rs. 2,100 was distributed in prizes. A brief account of each is given in Appendix III. Barhapur fair in Shahabad and Rangamati fair in the Chittagong Hill Tracts were not held during the year on account of plague in the former and cholera in the latter place.

49. *Provincial Museums.*—In addition to the Museum in Calcutta which is not treated in this report, there is a small museum at Dumraon which was established by the Raj in 1887. It is located in a hall of the Raj Dhuramsala building, as there is no suitable building in the farm for its accommodation. It contains a good collection of cereals, pulses, millets, drugs, dyes, oilseeds, fibres, spices, agricultural implements and miscellaneous articles of commercial value.

During the year under report a Natural History Museum was started at Darjeeling. It is managed by a Committee with the Deputy Commissioner as its President. It has already a fair collection of birds, butterflies, bees, wasps, ants, beetles and snakes from the district.

50. *Miscellaneous Experiments and Enquiries.*—The cost to Government of agricultural experiments and miscellaneous enquiries conducted under the direct supervision of this Department during the year under report amounted to Rs. 10,870-13-10, against Rs. 5,798-11-10 expended in the previous year. The details of the expenditure will be found in Appendix IV, and does not include grants amounting to nearly Rs. 75,000 for indigo research and to the Bihar Indigo Planters' Association.

51. In addition to the enquiries regarding deterioration of *jute* in several centres an attempt has been made to demonstrate the growing of varieties under expert supervision. The experiments in *cotton* growing, though a failure this year, may develop next year into useful object lessons. The fame of the improved methods of cultivation and sowing of cotton introduced by the Inspector-General of Agriculture has already spread in Behar, and this year the Inspector-General has imported five pairs of Guzarati bullocks and cultivators to make further demonstrations. In all the farms *rice* is a special field for experiment and drought-resisting and imported varieties have been grown with great success. Experiments with manures and in methods of transplantation of all kinds have been tried, and a special series of experiments with saltpetre have been included in the manure experiments.

52. *Indigo*—Government has, during the past year, kept up at a cost of Rs. 43,000 the Dalsingserai Research station. The staff consisted of Professor Bloxam and Mr. Finlow, Chemists, and Mr. Leake, Biological Botanist. They were engaged on a study of the chemistry of the leaf and improvements in the methods of manufacture. Professor Bloxam's report has not yet been published. Government has also contributed towards the cost of research conducted by Mr. Rawson at Pipra under the Behar Indigo Planters' Association. Lately a scheme for an indigo seed farm at Delhi, including experimental cultivation of the Java and other varieties, has been sanctioned. The seed-farming experiments will be duplicated in small areas by planters in Behar in order to determine whether it is necessary to obtain seed from the North-Western Provinces or whether seed can be produced in Behar. Proposals are being considered also for an "out-post" station at Mosehri near Muzaffarpur for laboratory research. This station will, it is proposed, be kept up out of the grant by Government to the Behar Indigo Planters' Association and will work in connection with the Pusa Institute. Offers have been made to Messrs. Bergtheil and Briggs to take charge of this outpost and with them Mr. Finlow will be associated for laboratory work. Inquiries into the bacteriology and chemistry of jute and analysis of soils and of water used for irrigation will also be conducted there.

53. In regard to *sericulture* much useful work has been done by the Berhampore Committee, Government has approved of the new policy of establishing nurseries with mulberry plantations and the grant is to be renewed for the current year under certain conditions. The object is to rear worms from pure "seed" examined under the Pasteur system. Itinerant overseers are also employed for the purpose of examining seed before purchase by rearers. In regard to *sugarcane* the Burdwan farm has provided canes to indigo-planters and others. In all the farms experiments have been made with varieties, in various methods of planting the canes, with irrigation and with various kinds of manures. At the request of certain representatives of the India Development Company, Government has recently sanctioned certain pumping experiments for irrigation from the Gundak of a large cane-growing area.

54. The inquiries for the prospectus of the new Agricultural College at Pusa and the large number of applications for admission at the next session to the Belgachia Veterinary College and to the Sibpur Agricultural classes seem very hopeful signs of awakening interest in these two sciences. I have also received many inquiries for assistance in various matters, *e.g.*, as to an agent for disposal of country produce in London, an expert to teach tanning, another to teach cigar-making, and several applications for teachers in sericulture. A Society in Orissa has been formed with the sole object of the development of the agricultural and industrial resources of that Province by private enterprise. Government has now sanctioned four travelling overseers instead of two and a closer supervision of experiments made by zamindars and raiyats as well as in Government and wards' estates is being exercised. It is undeniable that the experiments in Wards' and Government estates are made without much guidance or system. Until the Deputy Director takes this part of his duties off the Director's hands, this state of things must continue owing to the overwhelming settlement work in the Director's charge. The attention of the Department has also been directed to the useful work done by Agricultural Associations in the Central Provinces. In districts such as Murshidabad, Cuttack, Rangpur and Rajshahi, it has been ascertained that several gentlemen will co-operate with the District Officer in forming similar agricultural associations and an attempt will be made during the year to form them. The District Board of Rajshahi has actually offered to give land free of cost for a divisional farm and a zamindar in Mymensingh, Babu Brajendra Kishore Acherji Choudhuri, has already placed a farm of 28 acres under the direction of the Department and is bearing all expenses, including the cost of the overseer's pay. The District Engineer of Rangpur, Babu Ashu Tosh Lahiri, is conducting experiments in tobacco, cotton, and this year in jute varieties at his own expense. The Collector, Mr. P. C. Mitter, has also submitted proposals for the acquisition of 20 acres close to the cutcherry at Rangpur. As this is one of the most litigous districts in Bengal, the small farm at head-quarters may prove an attractive object lesson to suitors and others coming from all parts of the district.

55. We have not yet been able to introduce any Agricultural Gazette, but Government has allowed us to subscribe to the *Krishak* which is circulated to the agricultural staff, and our experts have been invited to contribute and make public the results of our experiments, &c.

In other ways improvements on the same lines as in the Central Provinces are being carried out. *Silos* have been constructed and experiments made with *juar* for fodder. Last year instruction as to the disposal of sewage was given at Municipal farms. Much more might be done if our staff was stronger and the Municipal authorities took more interest. Several new implements have been tested and, as the result of demonstrations at fairs and shows, there has been a larger sale of both implements and seeds. It is proposed also in course of time to have a seed and implement depôt at each farm. Nothing, however, has been done by the Department to encourage arboriculture. This is at present in the hands of District Boards. Two years ago they were ordered to submit a ten-years' programme, for planting of avenues, but the planting of trees by *patshala* students and an 'arbor' day remain to be introduced.

Officers of the Department.

56. I am very much indebted to both Assistant Directors, Messrs. D. N. and N. G. Mukerji, for the help and advice on scientific matters they have given me. Mr. D. N. Mukherji has made constant and useful inspections of the farms and Mr. N. G. Mukherji has ably supervised the sericultural operations, as well as the office work.

A great deal of useful work has been done by the travelling overseers. They are now four in number, and with the increase in the number of farms, the extension of jute inquiries and of cotton and other cultivation on experimental lines, a further addition to the staff will soon be necessary. Babu Hara Kumar Guha and Babu Nibaran Ch. Chowdhary have now acquired very considerable experience of agriculture. Mr. Alim has in addition to his other duties interested himself in Agricultural Banks. The work of Babu Rajeswar Das Gupta in demonstrations of machinery and implements at exhibitions and shows has been very valuable. He has received special thanks from several Committees and many inquiries for and purchases of exhibits have in consequence been made. The influence of these officers would be enhanced if they could be made Sub-Deputy Collectors, but still be seconded as travelling overseers or inspectors.

Other Officers.

57. My acknowledgments are due to Major D. Prain, I.M.S., Dr. J. Walter Leather, Mr. J. H. Burkill and Mr. J. W. Mollison. Mr. Mollison deserves the special thanks of the Department. I have had the advantage of touring with him on several occasions and he has freely given to me his time and advice regarding our cropping and other schemes. Government has also consulted him on many important matters.

I have the honour to be,

SIR,

Your most obedient servant,

S. L. MADDOX,

Offg. Director of Land Records and Agriculture, Bengal.

APPENDICES.

APPENDIX I.

A list of Agricultural Implements and Machines which have been tested in Bengal during the year ending 31st March 1904 and of those in use which are reported to have met with more or less marked success.

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by native agriculturists.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Rs. A. P.					
1	Behia Sugarcane mills.	Crushing sugarcane.	Yields best and highest outturn.	58 to 90 0 0	Messrs. Thomson and Mylne of Behia, Shahabad.	Commissioners of the Burdwan, Rajshahi, Patna and Orissa Divisions.	Very popular. Every part is made up of iron and cannot be easily put out of order. It has a wide reputation all over Behar and the United Provinces of Agra and Oudh.	386 mills sold by Messrs. Thomson and Mylne during the year.	
2	Sugarcane mill	Ditto ...	...	30 to 75 0 0	Messrs. Burn & Co., Howrah Iron Works.	...	...	12 mills sold by Messrs. Burn & Co., during the year.	
3	Shallow evaporating pan	Boiling sugar juice.	Yields best and highest outturn.	30 0 0	Messrs. Thomson and Mylne of Behia, Shahabad.	Commissioner of the Orissa Division.	The cultivators appreciate the value of the pan.	6 pans sold by Messrs. Thomson and Mylne during the year.	
4	Sibpur plough	Preparing lands for *rabi* crops, tilling lands and soil inverting.	Found well for *rabi* crops and cheap soil inverting plough.	10 0 0	Department of Land Records and Agriculture, Bengal, Calcutta.	Commissioners of the Rajshahi, Patna, Bhagalpur and Orissa Divisions.	The plough was tested with success. Two ploughings with local country plough are equivalent to one with this plough.	26 sold during the year.	The Commissioners of the Bhagalpur and Orissa Divisions say that the plough is too heavy for the ordinary bullocks.
5	Indian plough	Tilling the ground.	Efficiency. Low price	7 8 0	Messrs. Burn & Co., Howrah Iron Works.	Commissioner of the Rajshahi Division.	The plough was tested with success.	...	
6	Howard cotton "D."	For breaking and inverting soil.	Is useful practically on all kinds of lands (excepting paddy lands).	40 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Commissioner of the Patna Division.	Very substantial. Made entirely of iron. Has continued to give satisfaction. One ploughing with this plough is equal to three with wooden country plough, but it requires strong pair of bullocks to work it.	.....	
7	Bakhar (paring plough).	For distributing the sub-soil and killing weeds.	Made in the pattern used in the Bombay farms. Well serves the purpose for which it is intended.	3 8 0	Superintendent, Sripur Farm, Hathwa Raj.	Ditto	Found very useful for grubbing lands. Has continued to give entire satisfaction.	One supplied by the Superintendent, Sripur Farm, to the Chittagong Farm during the year.	
8	Spades (kodalies).	...	...	9 8 to 11 per dozen.	Messrs. Burn & Co., Howrah Iron Works.	...	...	6,835 sold by Messrs. Burn & Co. during the year.	
9	Rake	For collecting grasses in the field.	Very useful for collecting grasses. Very simple; can be made by village blacksmiths.	15 0 0	Superintendent, Sripur Farm, Hathwa Raj.	Commissioner of the Patna Division.	Has continued to give satisfaction. Extremely useful for cultivators.	...	
10	Paddy husker	Husking paddy.	...	120 0 0	Messrs. Burn & Co., Howrah Iron Works.	...	...	One sold by Messrs. Burn & Co. during the year.	
11	Maize huller	For separating maize from cobs.	About 10 maunds of grain is separated in a day. So light that boys can work it.	100 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Commissioner of the Patna Division.	Separates grain from cobs very effectually. Can be well recommended for small farms.	...	

APPENDIX I—*concluded.*

A list of Agricultural Implements and Machines which have been tested in Bengal during the year ending 31st March 1904 and of those in use which are reported to have met with more or less marked succes—concluded.

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by native agriculturists.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Rs. A. P.					
12	Winnower ...	For separating dust and small chaff from grain.	Can be used for clearing grain in the absence of wind. Works admirably.	200 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Commissioner of the Patna Division.	Clears very satisfactorily about 40 maunds of oats and 60 maunds of wheat and barley in a day. Can be well recommended for small farms.	...	
13	Chaff-cutter	For chaffing fodder.	Worked by steam power.	630 0 0	Messrs. A. Butler & Co., Muzaffarpur.	Ditto ...	Can be highly recommended for large farms where large number of cattle is kept. Can cut 175 to 200 maunds in eight hours.	...	
14	Ditto ...	Ditto ...	Worked by bullock gear.	295 0 0	Messrs. Burn & Co., Howrah Iron Works.	...	...	One sold by Messrs. Burn & Co. during the year.	
15	Ditto ...	Ditto ...	Worked by hand power.	200 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Commissioner of the Patna Division.	Cuts fodder very effectually, well equipped with improvements. Cuts about 50 maunds a day. Small farms should not be without this machine. Has been found to be working most satisfactorily.	...	
16	Ditto ...	Ditto ...	Ditto ...	63 to 70 0 0	Messrs. Burn & Co., Howrah Iron Works.	...	...	Four sold by Messrs. Burn & Co. during the year.	
17	Seed Bin ...	For storing grain.	Made entirely of iron sheets. Six feet in height and 4 ft. in diameter. Can hold 40 maunds of grain.	15 0 0	Superintendent, Sripur Farm, Hathwa Raj.	Commissioner of the Patna Division.	No grain can be damaged or eaten by rats. Very compact.	One supplied by the Superintendent, Sripur Farm, to Chittagong Farm during the year.	
18	Kite Motion pumps.	Rasing water	Worked by hand power.	300 to 475 0 0	Messrs. Burn & Co., Howrah Iron Works.	...	...	Six sold by Messrs. Burn & Co. during the year.	
19	Water lifts ...	Ditto ...	Ditto ...	350 0 0	Ditto ...	...	...	Two sold by Messrs. Burn & Co. during the year.	
20	Ditto ...	Ditto ...	Worked by bullock gear.	1,080 0 0	Ditto ...	...	...	One sold by Messrs. Burn & Co. during the year.	
21	Flour grinding mill.	Grinding flour	Efficiency	210 0 0	Ditto ...	...	...	Ditto ...	
22	"Inhoss" ...	Ditto ...	Worked by bullock gear.	500 0 0	Ditto ...	...	...	Ditto ...	
23	The "Humming Bird" Cream Separator.	For separating cream from milk.	Works effectually ...	200 0 0	Messrs. T. E. Thomson & Co., Calcutta.	Commissioner of the Patna Division.	Cream separated with this machine is far superior to that turned out by ordinary process. Found more useful in the cold than in hot weather.	...	
24	Butter churn	Churns cream into butter.	Works most satisfactorily.	70 0 0	Ditto ...	Ditto ...	Yields very good results and gives a quick output. Can be highly recommended.	...	
25	Eclair Vaporizer.	For applying insecticides to diseased crops.	Useful for spraying. Can be easily carried by one man.	50 0 0	Can be obtained through the Department of Land Records and Agriculture, Bengal.	Ditto ...	Can be recommended only for small holdings and small farms. Found fairly useful in doing work on a small scale.	...	

APPENDIX II.

List of Seeds and Manures distributed by the Department during 1903-1904.

SEEDS.	Mds.
(1) Potato	441
(2) Gram	19
(3) Wheat	53
(4) Oat	52½
(5) Cotton	30
(6) Paddy	7½
(7) Onion	5½
(8) *Patal* root	6
(9) Peas	3
(10) Barley	6
(11) Maize	1¼
(12) Jute	1½
(13) *Mung*	1¼
(14) *Musur*	1½
(15) *Maskalai*	1
(16) Cassava	740 cuttings.
(17) Betelnut seed	1,000
(18) Sugarcane about 49 kahans (1 kahan = 1,280 cuttings).	

Also brinjal, long peper, white mustard, radish, carrot, French-beans, onion, chilli, peas cabbage, cauliflower, beet, *methi*, kholrabi, tomato, lucern, *jeera*, *kelajeera*, *panmouri*, castor seed and other seeds.

MANURE.	Mds.
Bonemeal	162
Castor cake	161
Saltpetre	63
Rape cake	8
Mustard cake	1

APPENDIX III.

Agricultural Exhibitions and Fairs.

Suri Cattle and Produce Show.—This show was opened on the 1st February 1904 and lasted for five days. The Collector of Birbhum, who is also President of the Managing Committee, reports that the people have been paying more attention to the improvement of agriculture and industries, and now young cattle and poultry of better type, and grains, vegetables, and articles of arts and industries of better sorts are seen in the district and brought to the show. The Superintendent, Civil Veterinary Department, who attended the exhibition, does not share the Collector's opinion as far as the cattle exhibited are concerned. He writes:—"I have known this show now for about seven years and I cannot say that the cattle I saw this year are any improvement on those I saw seven years ago."

A sum of Rs. 240 was allotted from the Imperial grant for special prizes for country-bred cows and bulls. Selection was made by a Committee assisted by Major Raymond and a few local gentlemen. Rupees 250 was also granted by Government in aid of this exhibition.

2. *The Barasat Agricultural Show in the 24-Parganas.*—This exhibition was held on the 22nd, 23rd, and 24th January last in the Subdivisional Cutcherry compound. The principal agricultural and horticultural products of the subdivision were exhibited. Rupees 175 in cash and medals were given away as prizes to the successful exhibitors. As a result of holding an annual agricultural exhibition in the midst of an agricultural population many persons have begun paying systematic attention to improvement of certain kinds of agricultural produce. An overseer of this department was deputed to demonstrate the use of improved agricultural implements. He found the cassava plant growing wild at Barasat and demonstrated to the people the edible property of the root, and he also showed them how to make arrowroot and flour out of the roots. Rupees 100 was paid by Government in aid of this exhibition.

3. *The Khulna Exhibition.*—An exhibition of agriculture, industry and art was held at Khulna on the 15th February 1904 and continued till the 28th of the same month. Of the exhibits various kinds of fine and sweet-scented paddy, fibres of *Dharos*, Taleswar potteries, clay figures from Krishnagar, country-made steel trunks and boxes, silk cloths from Murshidabad, and silver works from Dacca deserve special notice. No other than indigenous articles were admitted as exhibits. Rupees 351 and 13 medals were awarded to successful exhibitors. An overseer of this department was deputed to this exhibition with some improved agricultural implements to explain to the people the advantage of their use. Government grant in aid of this show was Rs. 200.

Mr. N. G. Mukherjee, Assistant Director of Agriculture, who visited this exhibition, reports that button-making is a local industry. Links and studs are made out of

horns, bones, ivory, shells and wood. One or two of the men engaged in this industry might be sent to Mr. M. S. Das's workshop in Cuttack to get a wider range of experience in their own art. Cash-boxes, buckets, etc., of very good finish were exhibited by another local man. Miniature paintings on ivory in imitation of the Delhi ware were exhibited by another local man.

4. *The Kalimpong Exhibition and Fair.*—This *melâ* was held on the 25th and 26th November 1903. The exhibits were much the same as in the previous year. In all there were 1,700 entries in 19 classes. Prizes numbering 390 and amounting to Rs. 1,463 were distributed. Owing to the Tibetan frontier troubles, ponies and mules were not up to the average standard, but the number brought in was quite as large as usual. The cattle showed a decided improvement, largely, it is believed, due to the special prizes offered through the Civil Veterinary Department.

The poultry continues to develop and 12 pairs of English fowls were given away as prizes by the Deputy Commissioner of Darjeeling. Grains were not quite up to the last year's exhibits, as the season had been unfavourable, especially for *bhutta*. Roots, vegetables, fruits and dairy produce were up to the average, and the same might be said of exhibits illustrating local industries. An interesting feature of the last exhibition was weaving with the Serampore fly-shuttle loom. The Bengal Agricultural Department paid Rs. 450 from the Imperial fund for the award of special prizes for the improvement of cattle-breeding and Rs. 500 from the Provincial grant in aid of the fair.

5. *The Falakata Fair.*—This fair commenced on the 21st January 1904 and lasted till 20th February 1904. There were various amusements at the fair to attract the people. The principal articles brought in for sale were brass utensils, blankets, country and foreign cloths, and other indigenous products. No Bhutias came this year with dogs and musks as in previous years. The estimated value of the articles sold and the average daily attendance at the fair were Rs. 29,000 and 300, respectively, against Rs. 27,000 and 250 in 1902-1903.

6. *Santrabari Fair.*—The fair was announced to be held on the 10th January 1904, the date of payment of the Bhutan subsidy. All preliminary arrangements were made for the fair, but it was not held. It is reported that no Bhutia tradesmen came down, nor did any people go to Santrabari, owing to a rumour that there might be a rising, as the subsidy had not been paid to the Bhutan Government on the fixed date.

Out of the Government grant of Rs. 500 for the Falakata and Santrabari fairs, Rs. 300 was expended for the former, Rs. 20 for the latter. The balance (Rs. 180) was refunded. The Commissioner of the Rajshahi Division recommends the continuance of the grants, as the circumstances of the year under report were exceptional.

7. *The Tangail Industrial and Agricultural Exhibition.*—The exhibition was opened on the 14th February 1904 and lasted for ten days. It is supported by public subscription and the local zamindars take great interest in it. Among others, Mr. W. Pania, a local zamindar, presented two gold and four silver medals to the Exhibition Committee for award to the successful exhibitors. The exhibits this year were quite a good assortment. The local exhibits predominated, but there were also a decent number of exhibits from such distant places as Ludhiana, Gauhati, Malda, Berhampur, Benares, Bisnupur, etc. The silk cloth manufactured by local weavers compared favourably with those from other parts. The wooden statue of the late Roy Dwarka Nath Chowdhury, zamindar of Santosh, made by a local carpenter, was life-like. The working of the fly-shuttle loom drew crowds. The cultivation of potato and English vegetables is increasing in the locality. Rupees 150 in cash, and two gold and eight silver medals were given away as prizes to the best exhibitors.

8. *Sitamarhi Cattle Show.*—The show was held on the 27th March last. The number of bullocks brought to the show this year was about 30,000. There were only 100 cows or less of various sorts and two or three bulls of sorts. The Judging Committee consisted of the Subdivisional Officer, Sitamarhi, Mr. J. Wilson, Mr. E. W. C. Moore, and Major Raymond. Rupees 545 was distributed in prizes. It is reported that the Imperial prizes were not distributed in accordance with rule 9 of the rules for the award of such prizes. The Imperial grant will have to be withdrawn if the Committee do not strictly follow the rule.

9. *The Sonepur Horse and Cattle Fair.*—The fair commenced on the 29th October and lasted till 18th November 1903. This year the cattle show was held a day before the bathing day on the 4th November. Notices both in English and Hindi were printed and distributed for publication in all the districts of the Patna Division. The estimated number of animals brought into the *mêla* was as follows:—Elephants 600, cows 450, bullocks 19,000, horses 1,600, ponies 3,000, buffaloes 200, camels 22, and birds 2,000. About 3,000 horses and ponies, 570 elephants, 250 cows, 16,000 bullocks, 100 buffaloes, and three-fourths of the birds changed hands. Fifty-three bullocks and 200 ponies were purchased by the Military Department for the Tibet Commission. The sum total of all transactions at the fair was estimated at about Rs. 6,25,000. Veterinary Major Raymond and I visited the fair and helped the Committee in judging the animals for prizes. Twenty prizes at a cost of Rs. 365 were awarded from local funds, which includes the Government contribution of Rs. 200, and out of the Imperial grant of Rs. 240, four prizes amounting to only Rs. 55 and one silver medal could be distributed. The cows were as usual fair in number and quality. Most of the cows were from the United Provinces. No local bulls were seen. The buffalo cows of up-country breed were very good. The local buffaloes were inferior. One very good Patna bull competed, but the Patna cows were not good. The bullocks were, as usual, bad as a lot; they by no means represent the average quality of the animal brought to the fair. The chief reason appears to be that the show enclosure is far from the bullock lines, which is unavoidable on

account of the size of the fair. No real plough bullocks were exhibited, but some very fine cart bullocks were shown as plough bullocks.

A special prize of Rs. 20 was given for a bull buffalo-calf as no heifers were exhibited.

Major Raymond, Mr. O'Gilvy, and Mr. Abbott bought eight deshi cows for the Sripur herd.

10. *The Tintanga Mêla and Agricultural Show.*—The *mêlâ* was held this year on the 1st February 1904 and on the two following days. About 20,000 people gathered on the busiest day. A travelling overseer of this department attended the *mêla* and helped the Managing Committee in determining the prizes distributed to the exhibitors. Copies of a useful primer on agriculture were distributed at this show. The total receipts of this year from all sources amounted to Rs. 318-13 against Rs. 276-3 of the previous year. The total expenditure amounted to Rs. 279-9-6 against Rs. 269-6 in the previous year.

11. *The Malda Agricultural Exhibition.*—This exhibition was held this year at the sadar station of the district from 2nd to 7th February 1904. The usefulness of the exhibition having been appreciated by most of the residents of this district, it proved a greater success this year than last year. All the principal zamindars came forward to strengthen the hands of the Exhibition Committee and rendered very valuable help. The exhibits this year, though not very large in number, still surpassed those of the previous year greatly in variety and excellence. Among other things, the collection of grains and vegetable products was very satisfactory and attracted special notice. The exhibits sent by this department also attracted special notice. Improved implements, such as the Sibpur plough, a five-tined grubber, the Planet Jr. hand-hoe were exhibited at work, and there have been some requests from this district for these implements. Government contributed Rs. 150 in aid of this show. Money prizes and medals of the total value of Rs. 510 were distributed to the successful exhibitors. The total income of the exhibition from all sources amounted to Rs. 1,992, which was just sufficient to meet the expenditure.

12. *The Dumka Exhibition.*—An agricultural and industrial exhibition was held at Dumka on the 21st January last and it lasted for four days. Agricultural produce, articles of local manufacture, and live-stock (cattle and poultry) were exhibited and prizes amounting to Rs. 461 were distributed to the successful exhibitors. The exhibition was managed by a Committee, with the Deputy Commissioner of the Sonthal Parganas as its President, and the expenses were met entirely by private subscription.

13. *The Khagra Mêla and Cattle Show.*—The most important feature of the *mêla* this year was the opening of a cattle show on the 8th January last during the continuance of the *mêla*. The show was in every respect successful, considering that such a show was held for the first time in the district. Out of the Imperial grant of Rs. 180 to this show, nine prizes aggregating Rs. 150 were given to the owners of the best kind of cattle. The Khagra estate spent Rs. 155 in awarding ten prizes to the owners of the other classes of cattle not provided for in the Imperial grant. The *mêla* was, as usual, very successful and the income increased. About 300 elephants were brought and some 120 of them were sold. The class of cattle brought to the *mêla* is improving year by year.

14. *The Bihta Cattle Show.*—In previous years a *mêla* was held annually at Bihta on the *Sheo Ratri* day, in which only a few bullocks were brought for sale, but this year a very large cattle fair which is held annually at Kath Berhampore in the Shahabad district having been stopped on account of the plague, the cattle which would have been taken there came on to Bihta, and this cattle show therefore started under exceptionally favourable circumstances. Several thousands of good bullocks were brought for sale. The bulls, cows, and heifers exhibited were not really representative of the best stock available in the district, but it is hoped that if the show is again held next year, a better class of stock will be forthcoming. Rupees 180 was given from the Imperial grant for the award of special prizes at this cattle show.

15. *Rajnagar Cattle Show.*—During the year under report a cattle show was started at Rajnagar in the district of Darbhanga. It was held on the 20th January 1904. The object with which this cattle show was started was to encourage the breed of Bachour cattle. The number of cattle exhibited was large and the arrangements for housing them were good. The quality of the cattle was perhaps not so good as might have been expected and was scarcely representative of what the district can produce. Major Raymond and I attended this exhibition and helped the Judging Committee in awarding the prizes. The Maharaja of Darbhanga gave away the prizes. With the opening of the railway to Rajnagar next year and the assistance promised by the Maharaja of Darbhanga, the show should grow in size and popularity. The Provincial Government allotted Rs. 150 towards the show, and the Imperial Government Rs. 180 besides two medals. On the whole the show, considered as an initial effort, was a great success.

16. There was an exhibition held at Cuttack early in January in connection with the conference of the native Chiefs of Orissa. It was a great success.

APPENDIX IV.

Expenditure on miscellaneous experiments and enquiries made by the Department.

			Rs.	A.	P.
(1) Experiments other than those made in experimental farms			1,602	13	7
	Rs.	A.	P.		
(*a*) Cost of Egyptian cotton seed ...	31	0	1		
(*b*) Ditto Australian maize ...	56	4	0		
(*c*) Ditto ditto oats ...	42	12	0		
(*d*) Purchase of seed potatoes ...	351	15	0		
(*e*) Ditto other seeds and manures	359	0	3		
(*f*) Miscellaneous	761	14	3		
	1,602	13	7		
(2) Pay and travelling allowance of the agricultural overseers			4,708	7	3
(3) Purchase, etc., of implements			2,698	8	0
(4) Purchase of bulls			600	0	0
(5) Contribution for a seed store at Dumraon			300	0	0
(6) Miscellaneous, including Rs. 437 for pay and travelling allowance of the Head Master, Rampur-Boalia Diamond Jubilee Industrial School, and Rs. 67-11-9 for his deputation and travelling allowances to Bangalore ...			961	1	0
Total ...			10,870	13	10

APPENDIX V.

No. 39—XIX, dated Dehra Dun, the 22nd April 1904.

From—Dr. E. J. Butler, M.B., F.L.S., Cryptogamic Botanist to the Government of India,

To—The Director of the Department of Land Records and Agriculture, Bengal.

In answer to your letter No. 1107A., dated Calcutta, the 18th instant, requesting information on the results of the investigation of sugarcane diseases in Bengal, I have the honour to submit the following.

A number of fungus diseases of cane were found in Bengal. Of these by far the most serious is that usually known as "red-smut" due to the fungus *Colletotrichum falcatum*. It causes reddening of the interior with subsequent drying up of the cane. There is reason to believe that the disease is conveyed largely by the use of infected sets, and all sets showing traces of the red colour on cutting should be discarded. Excessive moisture in the ground is a predisposing cause to the disease. Severely attacked varieties should be replaced by others, as their continuance in cultivation only serves to increase the disease in succeeding years. Canes which have withered from the disease should be removed and burnt, as spore formation takes place on the surface of the cane after it has completely withered.

Cane-smut, due to *Ustilago Sacchari*, is common on certain varieties of cane. The majority, however, do not suffer.

"Khari" cane, much cultivated at Burdwan, is often attacked.

The disease is characterised by the growth of a long black whip-like organ from the tip of the shoot. On this spores are produced in great quantity and infect the ground and surrounding canes. Hence when a field has shown much disease it should be replanted with a different variety taken from some distance away. The cane from the diseased field should not be used as seed the following year.

Brown leaf-spot, due to an undescribed fungus, *Cercospora longipes*, is the commonest disease of the drier parts of the Presidency. The leaves are marked with oval spots surrounded by brown, red, and yellow rings. In the centre of these spots spores are formed, which successively infect every leaf produced, so that eventually sound leaves can scarcely be found. Every leaf in every field of certain varieties, in many parts of Champaran, Saran, Shahabad, Patna and other districts is affected by this fungus, and some of the most commonly grown sorts as Mango, Reora (Burli), Khari, etc., are specially liable to it. The extent of the damage caused, and the treatment are matters requiring further investigation. The effects are indirect by interfering with the proper functions of the leaf rather than, as in the two previous diseases, direct by destruction of the cane.

"Ring spot," due to the fungus *Leptosphaeria Sacchari*, was found in a few cases producing effects somewhat similar to the last. The leaves are marked by irregular dried-up spots and the green colour is eventually destroyed.

A rind disease caused by the fungus *Diplodia Cacaoicola* is common but causes little damage. Its effects appear to be somewhat similar to those of "red-smut," but are more

local. The rind is ruptured in numerous points arranged in line, and a black crust, formed by the spores, is found in the ruptured parts. Treatment does not appear called for at present.

The "pine-apple" disease of cane, caused by the fungus *Thielaviopsis ethaceticus*, was introduced in Bengal on two occasions within my own knowledge. It has not been found so far on native canes, and it is impossible that the disease should be very widespread in Bengal without having come to my notice. The disease chiefly affects the germination of sets. In several sugar-growing countries it is responsible for a loss, estimated, in some cases, at up to 50 per cent. of planted sets. In view of the risk which exists of the importation of diseases, of which this is a case in point, the uncontrolled introduction of foreign canes is a source of great danger.

A disease locally termed "Lahi" and said to be the worst cane disease known to the cultivators was seen in Saran and is not uncommon elsewhere. Its most striking feature is the deposit of a black, flaky, crust on leaves and other parts of the cane. This crust is composed of fungus elements. The fungus is, however, only indirectly connected with the disease, which is really due to the presence of scale insects. The latter excrete a sugary matter known as "honey-dew" on which the fungus grows. As a result of the black coating the leaves, already weakened from the attacks of the scale insects, rapidly become bleached and functionless. Attention should be directed to the insects as the primary cause of the disease.

Some other diseases of minor importance were investigated. A full, illustrated account, as far as present knowledge goes, of these diseases has been drawn up and will be submitted shortly to the Inspector-General of Agriculture for publication, when copies will be furnished to your office.

A

APPENDIX VI.

Statement showing results of experiments on sugarcane made by some of the Indigo Planters in Behar, 1903-1904.

Burhogah Experimental Plots. Irrigated. Saran District.

		Average yield per acre.	Increase.	Value of increase.	Cost of manure per acre.	Profit per acre.	Loss per acre.	Brix.	Sucrose.	Purity Co-efficient.	Remarks.
		Tons C. Q.	Tons. C. Q.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.				
1	No Manure—										
	Lalgira or Pounda ...	14 13 1	...	...	...	...	...	16·5	13·7	83	
	Samsara	10 7 0	...	...	...	...	...	17·1	14·1	82·4	
	Raora or Bhurli ...	13 9 0	...	...	...	...	...	19·1	17	89	
2	Rape Seed Cake—										
	Lalgira or Pounda ...	19 3 1	4 10 0	33 12 0	17 12 0	16 0 0	...	17·7	15	84·7	
	Samsara	14 12 0	4 5 0	32 10 0	17 12 0	14 14 0	...	16·5	13·4	81·2	
	Raora or Bhurli ...	18 15 0	5 6 0	38 2 0	17 12 0	20 6 0	...	19·1	16·7	87·4	
3	Castor Cake—										
	Lalgira or Pounda ...	17 10 0	2 6 3	17 4 0	30 8 6	...	13 4 6	16·4	13·4	81·7	
	Samsara	15 18 0	5 11 0	42 8 0	30 8 6	11 15 6	...	16·3	12·7	77·9	
	Raora or Bhurli ...	20 0 0	6 11 0	44 10 0	30 8 6	14 1 6	...	19	16·7	87·9	
4	Rape seed and Sulphate of Ammonia—										
	Lalgira or Pounda ...	19 9 0	4 15 3	35 0 0	29 15 3	5 0 9	...	15·5	12·2	78·7	
	Samsara	13 11 0	3 4 0	24 7 0	29 15 3	...	5 8 3	15·9	12·6	79·2	
	Raora or Bhurli ...	20 7 0	6 18 0	47 0 0	29 15 3	17 0 9	...	19·6	17	86·7	
5	Super Phosphate Sulphate of Ammonia and Potash—										
	Lalgira or Pounda ...	20 18 3	6 5 2	46 14 0	71 1 3	...	24 3 3	16·5	13·6	82·4	
	Samsara	13 11 9	3 4 0	24 7 0	71 1 3	...	46 10 3	15·1	11·5	76·1	
	Raora or Bhurli ...	17 2 0	3 13 0	24 14 0	71 1 3	...	46 3 3	19·2	16·8	87·5	
6	Seet—										
	Lalgira or Pounda ...	20 0 0	5 6 3	39 12 0	...	...	...	17·7	15·1	85·3	
	Samsara	28 19 0	18 12 0	142 9 0	...	...	...	14·4	10·8	75	
	Raora or Bhurli ...	19 1 0	5 12 0	38 3 0	...	...	...	19	17	89·4	

B

Burhogah Experimental Plots. Not irrigated

1	No Manure—										
	Lalgira or Pounda ...	4 13 0	...	...	...	...	...	18 4	15·9	86·4	
	Samsara	13 16 0	...	...	...	...	...	17·6	14·9	84·6	
	Raora or Bhurli ...	8 19 0	...	...	...	...	...	20·2	18·2	90·0	
2	Rape Seed Cake—										
	Lalgira or Panda ...	12 16 0	8 3 0	62 8 0	17 12 0	44 12 0	...	17·2	14·2	82·5	
	Samsara	13 3 0	Nil.	...	17 12 0	...	17 12 0	17·3	14·1	81·5	
	Raora or Bhurli ...	13 19 0	5 0 0	34 1 0	17 12 0	16 5 0	...	17·5	14·8	84·5	
3	Castor Cake—										
	Lalgira or Pounda ...	17 19 0	13 6 0	101 13 0	30 8 6	71 4 6	...	15·8	12·6	79·7	
	Samsara	20 12 0	6 16 0	52 0 0	30 8 6	21 7 6	...	16·7	13·2	79	
	Raora or Bhurli ...	16 11 0	7 12 0	51 13 0	30 8 6	20 4 6	...	17·8	15·0	84·2	
4	Rape Seed and Sulphate of Ammonia—										
	Lalgira or Pounda ...	24 12 0	19 19 0	145 11 0	29 15 3	115 11 9	...	16·9	13·5	79·8	
	Samsara	17 17 0	4 1 0	31 0 0	29 15 3	1 0 9	...	16·4	13·1	79·8	
	Raora or Bhurli ...	18 13 0	9 14 0	66 2 0	29 15 3	36 2 9	...	17·5	14·4	82·2	
5	Super Sulphate of Ammonia and Potash—										
	Lalgira or Pounda ...	18 15 0	14 2 0	108 2 0	71 1 3	37 0 9	...	16·8	13·3	79·1	
	Samsara	19 10 0	5 14 0	43 9 0	71 1 3	...	27 8 3	16·2	12·8	79	
	Raora or Bhurli ...	16 0 0	7 1 0	48 1 0	71 1 3	...	23 0 3	18·5	16	86·4	
6	Seet—										
	Lalgira or Pounda ...	18 7 0	13 14 0	94 0 0	...	...	...	17·5	14·7	84·0	
	Samsara	14 7 0	0 11 0	3 15 0	...	...	...	16·3	12·8	78·5	
	Raora or Bhurli ...	17 0 0	8 1 0	54 14 0	...	...	...	18·6	16·2	87·0	

Note—
The Samsara seed used in the B series with the exception of Plot 6, was delivered by cart and was in much better condition than that used in series A which was delivered by rail from Seeraha. Hence the better germination and heavier crop of this variety in B series.
The comparison of irrigated *versus* non-irrigated was vitiated by the fact that the non-irrigated (series B) was irrigated by Mr. Mackenzie in August during a prolonged break in the rains.
So that practically no deductions can be drawn from this series, so far as the plant (present) crop is concerned.
Judging from the low co-efficient of purity, the big canes in both series were still far from ripe when cut.
Value of increase to grower calculated at 4½ annas per maund big cane, 4 annas per maund small cane.

APPENDIX VI—*concluded.*

Statemnt showing results of experiments on sugarcane made by some of the Indigo Planters in Behar, 1903-1904.—concluded.

Seeraha Experimental Plots. Irrigated. District Muzaffarpur.

		Manure Constituents.			Average yield per acre.	Increase.	Value of increase.	Cost of manure per acre.	Profit per acre.	Loss per acre.	Brix.	Sucrose.	Purity Co-efficient.	Remarks.
		Nitrogen.	Potash.	Phosphoric acid.										
1	No manure—				T. C. Q.	T. C. Q.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A.				
	Kalagara (Bourbon) ...	...	...	...	15 16 4	...	...	...	...	...	17·8	16·15	90·7	
	Samsara	...	...	...	11 6 1	...	...	...	...	...	18·3	16 2	88·5	
	Bhurli	...	...	...	9 9 1	...	...	...	...	...	19·2	17·2	89 5	
2	Seeded—													
	Kalagara (Bourbon) ...	219·5	...	...	9 4 4	Nil	Nil	...	...	...	16·90	15·0	88·7	
	Samsara	219·5	...	...	20 14 3	9 8 2	79 8 4	...	...	...	17·62	15·83	89·8	
	Bhurli	219·5	...	...	11 11 2	2 2 1	15 13 6	...	...	...	16·98	15·13	89·1	
3	Rape seed cake—													
	Kalagara (Bourbon) ...	88·6	...	...	12 4 2	Nil	Nil	21 10 0	Nil	21 10 0	17·3	15·36	88·7	
	Samsara	88·6	...	...	18 6 3	7 0 2	59 4 4	21 10 0	37 10 4	Nil	18·47	16·20	87·7	
	Bhurli	88·6	...	...	12 0 2	2 11 1	19 3 6	21 10 0	Nil	2 6 6	18·25	15·96	87·4	
4	Castor cake—													
	Kalagara (Bourbon) ...	89·2	...	...	7 19 1	Nil	Nil	28 0 0	Nil	28 0 0	Diseased plot.			
	Samsara	89·2	...	...	18 12 1	7 6 0	61 9 6	28 0 0	33 9 6	Nil	18·88	15·16	84·7	
	Bhurli	89·2	...	...	12 14 0	3 4 3	24 4 6	28 0 0	Nil	3 11 6	18·95	17·03	89·8	
5	Rape seed and sulphate of ammonia—													
	Kalagara (Bourbon) ...	88·8	...	...	6 8 2	Nil	Nil	34 0 8	Nil	34 0 8	16·95	15·2	89·6	
	Samsara	88·8	...	...	16 2 3	4 16 2	40 11 4	34 0 8	6 10 8	Nil	17 85	15·46	86·6	
	Bhurli	88·8	...	...	12 8 2	2 19 1	22 3 6	34 0 8	Nil	11 13 2	18·25	15·9	87·1	
6	Castor cake and sulphate on ammonia—													
	Kalagara (Bourbon) ...	91	...	...	11 4 3	Nil	Nil	38 8 0	Nil	38 8 0	18·12	16·6	91·6	
	Samsara	91	...	...	19 6 1	8 0 0	67 8 0	38 8 0	29 0 0	Nil	16·75	13·8	82 3	
	Bhurli	91	...	...	13 6 2	3 17 1	28 15 6	38 8 0	Nil	9 8 6	18·78	15·93	84·9	
7	Super phosphate, sulphate of ammonia and potash—													
	Kalagara (Bourbon) ...	94·5	22·6	22·8	7 2 2	Nil	Nil	67 8 0	...	67 8 0	19·02	17·4	91·4	
	Samsara	94·5	22·6	22·8	17 6 3	6 0 2	50 13 4	67 8 0	...	16 10 8	19·05	16·86	88·5	
	Bhurli	94·5	22·6	22·8	11 4 0	1 14 3	13 0 6	67 8 0	...	54 7 6	18·38	16·3	88·6	

Seeraha Experimental Plots. Not irrigated.

1	No Manure—													For the sake of uniformity (*vide* Burhogah figs) the value of increase obtained by irrigation and manures has been calculated at 4½ annas per maund for big cane and 4 annas per maund for small, but I would point out that these figures do not represent the actual value of cane to the Company nor does the relative value for small and big cane appear to be correct. I believe 11 tons of big cane will yield a ton of sugar, whereas it will take about 15 tons o Bhurli to give a like result. The respective value placed on these varieties is as 9 is to 8. The irrigated plots at Seeraha had only three waterings.
	Kalagara (Bourbon) ...	...	...	...	15 10 2	...	...	...	...	...	16·53	14·5	87·7	
	Samsara	...	...	...	12 16 1	...	...	...	...	...	17·86	16·03	89·7	
	Bhurli	...	...	...	9 13 1	...	...	...	...	...	17·65	15·63	88·5	
2	Seeded—													
	Kalagara (Bourbon) ...	219·5	...	...	15 8 2	Nil	Nil	...	...	...	17·23	15·43	89·5	
	Samsara	219·5	...	...	9 7 2	Nil	Nil	...	...	...	17·65	15·66	88·7	
	Bhurli	219·5	...	...	14 3 1	4 10 0	33 12 6	...	...	...	18·05	15·93	88·2	
3	Rape Seed Cake—													
	Kalagara (Bourbon) ...	88·6	...	...	13 18 2	Nil	Nil	21 10 0	...	21 10 0	16·13	14·3	88·6	
	Samsara	88·6	...	...	12 19 2	0 3 1	1 5 10	21 10 0	...	20 4 2	17·6	15·36	87·2	
	Bhurli	88·6	...	...	7 6 1	Nil	Nil	21 10 0	...	21 10 0	18·95	17·0	89·7	
4	Castor Cake—													
	Kalagara (Bourbon) ...	89·2	...	...	9 16 3	Nil	Nil	28 0 0	Nil	28 0 0	Diseased plot.			
	Samsara	89·2	...	...	17 11 1	4 15 0	40 1 3	28 0 0	12 1 3	Nil	17·7	15·46	87·3	
	Bhurli	89·2	...	...	13 2 1	3 9 0	25 14 0	28 0 0	Nil	2 2 0	18·56	16·4	88·3	
5	Rape Seed and Sulphate of Ammonia—													Apparently ALL the plots at Burhogah were irrigated but the number of waterings given is not mentioned, it is remarkable, however, that the non-manured plots at Seeraha gave an average yield of 12 tons 13c. 1 qr. per acre, whereas the corresponding plots at Burhogah only averaged 9 Tons 2 cwt. 2 qrs.
	Kalagara (Bourbon) ...	88·8	...	...	7 2 3	Nil	Nil	34 0 8	...	34 0 8	17·45	15·56	89·1	
	Samsara	88·8	...	...	12 8 2	Nil	Nil	34 0 8	...	34 0 8	16·85	14·23	84·4	
	Bhurli	88·8	...	...	10 17 0	1 3 3	8 14 6	34 0 8	...	25 2 2	19·3	17·16	88·9	
6	Castor Cake and Sulphate of Ammonia—													
	Kalagara (Bourbon) ...	91	...	...	15 9 1	Nil	Nil	38 8 0	...	38 8 0	17·22	15·53	90·1	
	Samsara	91	...	...	13 18 2	0 17 1	7 4 4	38 8 0	...	31 3 8	18·08	15·73	87·0	
	Bhurli	91	...	...	15 8 0	5 14 3	43 0 6	38 8 0	...	Nil	18·14	16·2	89·3	
7	Super Phosphate Sulphate of Ammonia and Potash—													On the other hand the manured plots at Burhoga show a larger increase in yield than the corresponding plots at Seeraha.
	Kalagara (Bourbon) ...	94·5	22·6	22·8	9 1 3	Nil	Nil	67 8 0	...	67 8 0	17·38	15·7	90·3	
	Samsara	94·5	22·6	22·8	14 8 2	1 12 1	11 14 8	67 8 0	...	55 9 4	17·62	15·1	85·7	
	Bhurli	94·5	22·6	22·8	12 10 1	2 17 0	21 6 0	67 8 0	...	46 2 0	18·8	16·98	90·2	

R. Hudson,
26th April 1904.

B. S. Press—877J—500—21-6-1904—C. A. P.

REVENUE DEPARTMENT.

AGRICULTURE.

CALCUTTA, THE 15TH AUGUST 1904.

RESOLUTION—No. 3490.

READ—

The Report of the Agricultural Branch of the Department of Land Records and Agriculture, Bengal, for the year 1903-04.

Letter No. 5257A., dated the 6th July 1904, from the Board of Revenue, submitting the report with their remarks.

Read again—

Resolution on the same report for the year 1902-03.

The Department was in charge of Mr. S. L. Maddox throughout the year. Altogether 184 days were spent by him on tour in connection with settlements, agricultural work and sericultural operations.

2. *Scientific enquiries.*—Considerable progress was made during the year in the enquiry into the alleged deterioration of jute; and special investigations were made into the practice of fraudulently watering the fibre. The Department had the advantage of receiving expert advice in the course of these enquiries from the Inspector-General of Agriculture, the Superintendent of the Royal Botanic Garden, the Reporter on Economic Products, and the Agricultural Chemist; and the Lieutenant-Governor desires to thank these officers for the valuable assistance they rendered. Experiments with jute were conducted at the Burdwan farm and at Faridpur and Jalpaiguri; and endeavours were made to demonstrate the growing of varieties under expert supervision. Special attention was paid during the year under review to the subject of cotton cultivation. Experiments were undertaken with the object of ascertaining what varieties are adaptable to local conditions and what is the best method of production; seeds were widely distributed; and efforts were made to extend local cultivation. The Lieutenant-Governor regrets, however, to notice that the results obtained from the seeds distributed by the Department were on the whole discouraging. There is, in the opinion of the Inspector-General of Agriculture, great scope for extending the cultivation of superior cotton in Bihar; and it is proposed to arrange for extensive experiments at Pusa in comparing varieties, testing methods of cultivation and improving varieties by selection and cross-breeding.

3. *Experimental farms and experiments in Government estates and Wards' estates.*—An experimental farm was started during the year at Cuttack, in accordance with the suggestion of the Government of India that it might be possible to hasten the development of improved agricultural methods in Orissa by the establishment of an experimental farm which would show the cultivators what can be done with water always at command. A scheme of experiments in irrigation which has been approved by the Lieutenant-Governor will now be undertaken at this farm and at the Dumraon and Burdwan experimental farms. The results of the experiments made at the Sibpur farm were of especial value as showing that certain varieties of *aus* paddy are drought-resisting and prolific: the Lieutenant-Governor will await with interest the results of the experiments which it is proposed to make under different conditions of soil and climate.

4. Sir Andrew Fraser is gratified to observe the growing interest in agricultural progress which is being displayed in various parts of the Province. A society has been formed in Orissa with the object of developing the resources of that Province by private enterprise; the District Board of Rajshahi has

offered to give land free for a divisional farm; a gentleman of Mymensingh, Babu Brajendra Kishore Acharji Choudhuri, has already placed a farm under the direction of the Department, and is bearing all the expenses of its management; and, as the Director notices in paragraph 35 of his report, excellent work is being done by private gentlemen in advancing improved methods in their own districts. It is observed, however, that the experiments conducted through the tenants of Government and wards' estates and other private individuals gave, on the whole, unsatisfactory results; and that it was only where they were under the personal supervision of District Officers or other responsible persons that they proved successful. To remedy this state of affairs, the employment of four travelling overseers has been sanctioned by Government, and a closer supervision of experimental work in the Province is now being exercised. The Lieutenant-Governor is firmly convinced, however, that very much more requires to be done. The Agricultural Department has admittedly failed hitherto to make known among the people the results which have been attained by experiment. Accounts of the various operations undertaken are published annually, but they have not reached the cultivating classes; and even in the vicinity of the various agricultural farms improved methods of cultivation have not been adopted. There are many zamindars and merchants keenly interested in agriculture, but their sympathy and co-operation have not been enlisted. In these circumstances, the Lieutenant-Governor is of opinion that an agency is wanted to disseminate agricultural knowledge, and to awaken further interest in, and discussion of, the agricultural development of the Province. Experience in the Central Provinces has shown what immense advantage has followed the creation of advisory Agricultural Associations; and it appears to His Honour that there is a great field of work open to such Associations in Bengal. Sir Andrew Fraser has, therefore, decided, as a first step, to establish a Provincial Agricultural Association at Calcutta to co-operate with the Director in his work in this Province. Its chief work will be in connection with agricultural experiments and the dissemination of the results of such experiments; but it will also advise Government as regards the programme of work of the Agricultural Department, as well as concerning all matters affecting the improvement of agriculture and the best method of reclaiming waste lands. Sir Andrew Fraser hopes that if such an Association proves successful, it will be possible to form, in the interior, Branch Associations composed of members keenly interested in the advancement of agriculture and ready to push improved methods and to carry out in their own villages any practical experimental work which may be entrusted to them.

5. *Sericulture.*—The Bengal Silk Committee continued to carry on its useful work in popularising the use of healthy seed and extending mulberry plantations. The Lieutenant-Governor is pleased to observe the progress made in extending the silk industry in Midnapore and the Tributary States of Orissa. In Midnapore a school has been established by local efforts with the object of reviving the silk industry in the district and of improving the agricultural condition of the people by giving instruction in agriculture and sericulture. In the Keonjhar State a trained sericulturist was employed to supervise the development of sericultural operations; and in Mourbhanj, mulberry plantations were established and cocoon-rearing and reeling was introduced.

6. *The Sibpur Agricultural Class.*—The results of the examinations were satisfactory. The Director observes, however, that the supply of qualified scholars is not equal to the demand for their services, and that the scheme of divisional farms must necessarily proceed slowly for want of expert officers in whose charge they can be placed. The Lieutenant-Governor trusts that the establishment of the Pusa Research Station and College will lead to a greater number of students coming forward, and looks to that college for valuable assistance in respect of the trained managers and fieldmen who will be available for the local farms. His Honour welcomes the offer of a scholarship to be held at the Pusa College, which has been made by the Maharani of Dumraon, and shares the hope of the Director that District Boards will come forward to support promising boys who have attended agricultural classes in their own districts.

7. *Spread of Agricultural Education.*—The Director of Public Instruction has been directed to submit a report showing what measures he would

recommend both to develop rural primary schools in Bengal and to supply courses of training specially suited for the teachers of such schools. He will now be asked, in submitting his proposals to consider the suggestions made by Mr. Maddox in paragraph 43 of his report. The divisional farms will afford suitable centres for the purpose.

8. The thanks of the Lieutenant-Governor are given to Mr. S. L. Maddox for the ability and zeal with which he has conducted the administration of the Department under his control. His commendations of the Assistant Directors, Mr. D. N. Mukherji and Mr. N. G. Mukherji, and of the travelling overseers under him have been noted.

By order of the Lieutenant-Governor of Bengal,

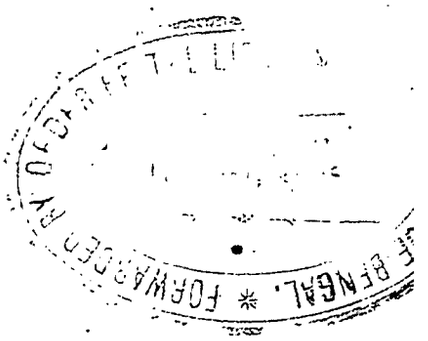
H. LEMESURIER,

Offg. Secy. to the Govt. of Bengal.

B. S. Press—3659C—670—26-8-1904—T. N. R.

REPORT

OF THE



AGRICULTURAL BRANCH

OF THE

DEPARTMENT OF LAND RECORDS AND AGRICULTURE,

BENGAL.

For the year ending 31st March 1905.

133034

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DEPARTMENT OF LAND RECORDS AND AGRICULTURE, BENGAL.

No. 2735A.

FROM N. D. BEATSON BELL, ESQ., I.C.S.,
Offg. Director of Land Records and Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE, L. P.

Dated Calcutta, the 15th August 1905.

SIR,

I HAVE the honour to submit the report of the Agricultural Branch of this Department for the year ending the 31st March 1905. This is the twentieth annual report.

CHAPTER I.

INTRODUCTORY REMARKS.

2. Mr. S. L. Maddox, I.C.S., was in charge of the Department from the beginning of the year to the 28th March 1905, when he made over charge to me. He was on tour for 141 days during the year and inspected the farms at Burdwan, Sripur, Dumraon, Gouripur, Chittagong and Cuttack. He went to Rangpur and Rampur Boalia and conferred with the local officers and non-official gentlemen on the subject of establishing Agricultural farms in those places. He visited Dalsingserai and Sirsia Research stations and attended the meeting of the Agricultural Board of India at Pusa in January last. He also attended a meeting of the Bengal Silk Committee at Berhampore in the same month. The Sonepur Fair was visited in November 1904.

Messrs. Debendra Nath Mookerji and Nitya Gopal Mukerjee were Assistant Directors throughout the year. Mr. F. Smith was appointed to the post of Deputy Director of Agriculture, Bengal, and he joined his appointment on the 28th December 1904. The inspecting staff of the Department included also four travelling overseers.

3. The Inspector-General of Agriculture in India made a special grant of Rs. 12,000 for agricultural improvements in this Province. Out of this sum, Rs. 8,000 was paid to the Bengal Silk Committee for establishing additional "seed" nurseries. The balance of Rs. 4,000 was utilised in purchasing for free distribution certain manures (bone meal and saltpetre) which are indicated by prolonged experiments on the Burdwan Farm to be the most profitable manures for paddy in those tracts of which the Burdwan Farm is typical. The Maharajadhiraj of Burdwan and his officials gave valuable help in distributing the manures.

4. The Agricultural specialists of the Imperial staff and the Provincial Directors, and Assistant Directors and Deputy Directors of Agriculture, the Provincial Superintendents, Civil Veterinary Department, and other experts in Agriculture met at Pusa in January last and formed the first Board of Agriculture in India. The recommendations and suggestions of the Board are being considered and carried out, as far as possible, in this Province. The Agricultural College at Pusa will not be ready to receive students for two years yet. The Pusa specialists, however, have begun training a few men in general farming, agricultural chemistry, entomology, etc., to act as field-men and assistants in the various Provinces. Although Pusa is an Imperial institution, a herd of cattle is maintained there at the cost of the Bengal Government, which

makes an annual contribution of Rs. 50,000. The herd consists of specially selected local cattle. No cross-breeding is allowed. It is expected that the herd will be of great use in improving the cattle of this Province.

5. The Agricultural Department of the Province is now being entirely reorganised. The Government of Bengal submitted a scheme to the Government of India, orders on which have recently been received. It is unnecessary to discuss the scheme in the present report.

CHAPTER II.

SCIENTIFIC AND NATIONAL ENQUIRY UNDER IMPERIAL CONTROL.

6. *Dioscorea (yams).*—The subject is still under investigation. Owing to the sudden illness of Mr. Burkill, who was making a special study of these plants, no report has yet been issued on the subject.

7. *Collection of articles for the Indian Museum and the Imperial Institute, London.*—During the year under report specimens of "Lodh plant" and "Revand chini" (*Rheum emodi*) were collected by this Department through its travelling overseers for the Imperial Institute, London, and the Indian Museum.

8. *Deterioration of jute fibre.*—The Sub-Committee of the Board of Scientific Advice dealing with agricultural products have written a valuable report on the deterioration of jute in this Province. In the opinion of the Sub-Committee there is not only no proof that any degeneration in either of the two species of jute plants has occurred, but there is strong evidence that the plants are now precisely as they were a century or more ago. The best kinds, now as then, if cultivated liberally yield excellent crops; and their fibre, if properly extracted, is also excellent. The explanation of the deterioration lately so much complained of seems partly to lie in the fraudulent watering of jute which discolours and weakens the fibre and partly in the action of the buyers themselves who now exercise less discrimination owing to the increasing demand for the fibre. In 1904 also, as in the two preceding years, various experiments were carried out with jute on the Burdwan Farm on the lines indicated by Mr. Mollison, Inspector-General of Agriculture, in India. As Burdwan was practically outside the jute area, some of the experiments were duplicated at Jalpaiguri, Rangpur and Faridpur. A separate report is being drawn up for submission to the Scientific Board. The suggested legislation to penalise the fraudulent watering of jute is still under discussion. There is a growing feeling against departing from the old maxim of *Caveat emptor*.

9. *Cotton cultivation.*—If Indian cotton is generally, from a European standpoint, of poor quality, the Bengal varieties are especially so. An attempt was made during the year under report to introduce superior varieties of Egyptian and American cotton, also the best varieties from other Provinces of India. It is clearly recognized that the attempt is strictly at the experimental stage and no seeds were distributed to the actual cultivators who are generally too poor to accept the risk inseparable from an experiment. The seeds were distributed through Collectors and Sub-divisional Officers to Court of Wards and Khas-Mahal Managers and also to well-to-do private gentlemen interested in agriculture generally, and in cotton particularly. The chief varieties which were distributed were as follows :—

American.	Egyptian.	Indian.
1. Allen's hybrid.	1. Yannovitch.	1. Broach of Gujerat.
2. Boyd's prolific.	2. Abbasi.	2. Acclimatized American-Dharwar.
3. Sea Island.	3. Metaffifi.	3. Khaki of Burma, &c.

The year was very unfavourable to cotton, and in most places the trial was a failure. The seeds were distributed in June-July, but immediately after sowing there was heavy and continuous rain. The winter was unusually severe, the frost in February killing even the indigenous varieties of the raiyats.

The general failure of the foreign varieties of cotton, the seeds of which were distributed last year by this Department, does not therefore justify any definite conclusion as to the unsuitability of the Province for these varieties. Here and there one variety or another gave some promise, and on the whole the American varieties may be said to have done better than the Egyptian, while the acclimatized American variety of Dharwar did better than the freshly imported varieties. A most useful pamphlet entitled "Cotton in Bihar" was published by Mr. Lefroy, Entomologist to the Government of India, being notes compiled from observations made at Pusa and in Bihar generally. The seeds of most of the varieties tried in 1904-1905, together with those of Bani and Jari cotton from Central Provinces and Buri cotton from Manbhum (Bengal) have again been distributed for experimental cultivation in 1905-1906. Special care has been taken to supply the seeds early on this occasion, in some instances as early as April and even March. At the instance of the Government of India an attempt has been made to select seeds of the indigenous varieties of cotton in the most important cotton centres in the Province—Saran, Muzaffarpur and Singhbhum. The early cotton was over before the operations were commenced, so only the late varieties were chosen for selection. The seed is generally being re-issued to the same people from whose fields it was originally selected. It is proposed to keep a continuous record for a series of years of the selected seed with all particulars as to the varieties, soils and seasons, &c.

10. *Cultivation of Wheat*.—Fifty maunds of Muzaffarnagar wheat seed and the same quantity of saltpetre manure were distributed to the districts of Nadia, Murshidabad, Rajshahi, Pabna, Palamau, Hazaribagh and to the districts comprising the Patna and Bhagalpur Divisions. From the reports received from the local officers it appears that the experiment in Bengal Proper was not together satisfactory, but in the Bihar districts and in the districts of Hazaribagh and the Sonthal Parganas better results were obtained. The unusual cold wave of February considerably damaged the wheat crop and the *rabi* crops generally throughout the Province. For a fuller account, *vide* paragraph 22.

11. *Irrigation Experiments*.—These were undertaken on lines indicated by the Irrigation Commission. In Bihar water is drained off from the paddy-fields for a fortnight in September (from about 10th to 24th) after which they are irrigated again. This draining off of water is locally known as *nigarh*. It is quite unknown in Bengal proper or Orissa, and naturally accentuates the demand for water when the irrigation begins again. There is generally rain at the end of September or early in October (*hatiya* period), but if there is no rain the demand for water becomes so keen that the Canal Department has very great difficulty in meeting it. An experiment was made at the Dumraon Farm to see if the practice of *nigarh* has really any advantage. The experiment was duplicated on some land especially selected for the purpose near Ramnagar in district Shahabad, also commanded by a distributary of the Sone Canal. Both here and at Burdwan and Cuttack there were other experiments meant for the purpose of determining how much water is really best for paddy and at what intervals. The Burdwan experiment failed through failure of the Eden Canal to supply water in October. The *nigarh versus* no *nigarh* experiment at Dumraon failed also owing to the drought, as there was no water in the fields to be drained off. Among other experiments—with wheat one irrigation was found better at Dumraon than two irrigations. With sugarcane furrow irrigation was found better at Burdwan than flooding the entire field. But it is too early to summarise the results, and the experiments are being repeated at all the places at which they were tried last year.

CHAPTER III.

SCIENTIFIC AND LOCAL ENQUIRY UNDER PROVINCIAL DIRECTION.

Government Farms.

12. Besides the three farms (Sibpur, Chittagong and Cuttack) mentioned in the report for 1903-04, arrangements were made during the year under report for establishing two more farms (one at Rampur Boalia and the other at Rangpur). All these farms are under specially-trained Superintendents or Overseers.

13. *Sibpur Farm.*—The year under report was the 18th year in the existence of the farm. It was originally under this Department as an experimental station but since the establishment of the agricultural classes at Sibpur Civil Engineering College, it has been transferred to the Education Department, and is now worked chiefly as a demonstration farm for the benefit of the students.

Manure experiments were conducted with paddy, jute and potatoes. In the case of paddy, castor cake (10 maunds per acre) has been generally found much better than a mixture of bonemeal (5 maunds) and saltpetere (2½ maunds). Bonemeal alone (5 maunds) does not give as good an outturn as it does at Burdwan. Green manuring with Dhaincha (*Sesbania aculiata*) was found equivalent to an application of 150 maunds of cowdung per acre. In the case of potatoes, 20 maunds of castor cake have been found better than 300 maunds of cowdung.

The discovery made by Mr. N. G. Mukerji, while in charge of the farm, that seeds obtained from the shoots of *aus* paddy after the crop is harvested, give, when sown next year, an early *aman* paddy more prolific than the original *aus*, was again tested. The farm authorities corroborate Mr. Mukerji.

Among a number of varieties of paddy, Dudkalma of Burdwan and Kalabari of Chittagong were found the most prolific. But both these are coarse varieties. Among fine varieties, Samudra bali and Dadkhani were found the best.

Among potatoes, the Nainital gave a larger outturn than the Patna or Umballa.

The Java sugarcane from first year's ratoon gave a slightly higher outturn, and from second year's ratoon a slightly lower outturn, than freshly planted Samsara variety. The Chittagong variety was attacked with a fungoid disease (*trichosphœria*) and had to be wholly removed.

The *desi* jute (*Corchorus olitorius* species) gave a higher outturn than the Serajganj jute (*C. capsularis* species).

The income of the farm during the year under report was Rs. 1,466 against Rs. 826 in the previous year, and the expenditure was Rs. 3,620 in both the years.

14. *Chittagong Farm.*—The farm was started in 1900 as a Demonstration Farm. It is situated in a valley surrounded on three sides with hills. There is a hill stream which is bunded up to form an irrigation reservoir with a masonry weir for the escape of all superfluous water. There was a second reservoir fed by another hill stream, but the dam gave way some time ago and it has not yet been decided whether it is necessary to repair it. The area under cultivation is 25 acres. In 1902-03 a further area of 54 acres was added to the farm, but little of this has come under cultivation yet. The surface is undulating and has been terraced in many parts, making the conditions necessary for carrying on comparative experiments, especially with paddy, rather difficult. Indeed, no attempt was made to compare different manures, or methods of cultivation, or varieties of crops, till the year under report, when it was recognized that the best use of the farm would be to investigate these points in a tract where the soil and climatic conditions are widely different from those of the central and western districts of the Province.

Only a very few comparative results were obtained last year. They are summarised below, but further investigation in every case is necessary. In potato cultivation cutting the tuber before planting was found disastrous, the outturn from the un-cut tubers being about six times as much as from the cut sets. This is probably due to the exceedingly heavy rainfall (over 100 inches) of the station. Irrigation was found useful, but there was a very fair outturn from the unirrigated plots also. If this is confirmed by subsequent experience, it would bring potato cultivation within the means of ordinary local raiyats who are not familiar with any irrigated *rabi* crops. Sowing potatoes on ridges was found better than sowing them in shallow furrows, and the Nainital and Patna varieties under equal treatment gave the same results. Cotton (Egyptian and American varieties, also Burma Khaki and Broach) was sown on the level and on the hill slopes. The varieties sown on the level suffered severely from excessive rain in July and August. Those sown on the hill

slopes (Yannovitch and Boyd's Prolific) gave very good promise at first, but they too succumbed to a violent cyclonic storm in November.

In paddy cultivation there is a good deal of difference between one district and another. In Mymensingh, for instance, each seedling is planted by itself in a hole, while in Chittagong 8 or 10 seedlings are put in together. In the distance apart at which the seedlings are planted, there is also a good deal of difference. An experiment was started at Chittagong farm to ascertain whether the local practice is the best or whether it admits of improvement. Definite results have not yet been obtained. The Burma and Assam varieties of paddy that generally failed in the other farms failed at Chittagong also, though from its affinity to both the Provinces there was ground for expecting a better result. The local Kalabail (coarse) and Rosail (fine) varieties gave about equal results. As for manures the soil seems to respond well to an application of bonemeal. Three maunds of it gave an increase of 5 maunds of grain over the unmanured plot, while 6 maunds of bonemeal gave an increase of 9 maunds of grain over the unmanured plot. English garden peas and Indian field peas were grown with success. Turnips, radishes, cabbages and cauliflowers also gave good results. *Patâl* continued to enjoy the popularity it has done from the beginning of the farm. Many people in the district seem to have taken up its cultivation. Maize failed through excessive rain. Linseed, mustard, gram and wheat also failed more or less from various reasons.

A *puccka* threshing floor covered with corrugated sheets, a new cattle shed with brick-on-edge flooring, and two masonry cemented manure pits were made during the year under report. The godown was accidentally burnt down in February causing a damage of about Rs. 400. The total capital expenditure was Rs. 3,203. The current expenditure amounted to Rs. 2,996.

15. *Cuttack Farm.*—This farm was started under the orders of the Government of India in April 1904. The main object of the farm is to demonstrate the value of irrigation. The farm consists of about 60 acres, of which about 40 acres are low land fit only for paddy and jute. Of the remaining 20 acres, a portion is taken up with farm buildings, roads and water-channels, leaving about 15 acres for *rabi* crops. The high land is very sandy and poor, but the low land is fairly good and representative of the district. It is irrigated from a distributary of the Taldanda canal, Mahanadi Division.

Paddy, potatoes and cotton were the principal crops grown on the farm in this the first year of its existence. Some ground nuts and American cow peas were also grown.

Irrigation experiments, manure experiments, variety experiments and experiments in methods of cultivation were tried with paddy. In the irrigation experiment applications of 6″ and 4″ of water were compared with no irrigation. The experiment was vitiated by water percolating through the highly porous partition ridges between the plots. In future the ridges will be widened to avert this source of error. But so far as the experiment went 6″ of water gave the best result.

In the manure experiment with paddy, castor cake (10 maunds) gave a higher outturn than bonemeal (5 maunds) and saltpetre (1½ maunds). But the Uriya cultivator has still a very strong objection to touching bonemeal even if it give the best of results. Eleven varieties of paddy, seven fine and four coarse, were tried side by side under equal treatment. The coarse varieties on an average gave an outturn of about 24 maunds of grain against 16 maunds in the case of the fine varieties. The local Khajura (coarse) and the Burdwan Samudrabali (fine) did best of all.

In methods of cultivation transplanting paddy seedlings 12″ apart was found better than transplanting them 6″ or 9″ apart. It was found better to wash off the earth at the roots of the seedlings before transplanting them instead of leaving the earth adhering to the roots. Whether the best result is obtained from broadcasted seed or from transplanted seedlings raised in a nursery is an important question upon which no definite opinion can yet be given.

In potato cultivation the Patna variety was found twice as prolific as the Nainital or local variety.

Twenty maunds of castor cake was found a much better manure for potatoes than an equal weight of mustard and ginjelly cake as commonly used by the local raiyats. Cattle manure was found of very little value.

This is due to the way in which the manure (*khata*) was prepared and kept. The local method was followed. In future the adoption of improved methods is expected to bring about improved results. The total cost of keeping up the farm was Rs. 4,381. The total receipts amounted to Rs. 1,229, leaving a nett loss of Rs. 3,152.

PRIVATE FARMS UNDER THE CONTROL OF THE DEPARTMENT.

16. *Burdwan Farm.*—The proprietor is the Maharaja of Burdwan. The farm was opened in 1885 while the estate was under the Court of Wards. The Maharaja came of age and took the estate under his own control in 1903. He has wisely decided to keep up the farm established by the Court of Wards. The farm consists of about 33 acres, of which only 15½ acres are under experimental cultivation. Twelve and a half acres are cultivated non-experimentally in order to keep the land occupied for extension of experiments, and the remainder is occupied by farm buildings, roads, water channels, grazing land, etc. Only four crops are grown on this farm, *i.e.*, paddy, jute, potatoes and sugarcane. The seasons were on the whole favourable. There was no rain in October, which is the critical period in the life of the winter paddy plants, but irrigation from the Eden canal partly made up for the deficiency.

The total expenditure amounted to Rs. 3,002 against Rs. 4,389 of the preceding year, and the total receipts to Rs. 1,651 against Rs. 2,041 of the preceding year. The nett cost of maintaining the farm was therefore Rs. 1,351.

There are two series of manure experiments with paddy. In one the manures are applied in fixed quantities without analysis, and in the other they are applied on analysis in quantities so as to supply in each case 50 lbs. of nitrogen per acre. In the first series 3 maunds of bonemeal and 30 seers of saltpetre per acre again gave the highest result, as they have uniformly done since the experiment was started in 1891. It is noteworthy, however, that in the other series which was started in 1897 in another part of the farm much larger quantities of the same manures (nearly four times) have not produced anything like the same results.

In the green-manuring series ploughing in *Dhaincha* (*Sesbania aculiata*) gave a higher outturn of paddy than an application of 50 maunds of cowdung per acre.

In the case of jute, cowdung (75 maunds) proved for the third year a better manure than castor cake (7 maunds) or bonemeal (10½ maunds) or a mixture of bonemeal (5¼ maunds) and saltpetre (4¼ maunds).

In the case of potatoes also cattle manure gave as in previous years the best financial results, if not always the highest outturns. A mixture of saltpetre (7½ maunds) and bonemeal (21 maunds) did not give an increase large enough to justify the expenditure. A larger outturn was obtained from castor cake (12 maunds) and saltpetre (7½ maunds) than from castor cake alone (24 maunds), but the process is certainly not economical.

As already mentioned (paragraph 2) a considerable portion of the special grant of the Inspector-General of Agriculture was here utilised for the free distribution of bonemeal and saltpetre and for the dissemination of pamphlets showing the value of these manures in paddy.

In experiments dealing with "methods of cultivation," it was found better in the year under report to plant one paddy seedling per hole, instead of three or four seedlings per hole, which is the local practice. In matters of this sort, however, experiments must extend over a prolonged period and must give unimpeachable results before they can be recommended to the cultivators. In the matter of spacing seedlings the experiments of 1904-05 point to 9″ or 12″ as the best distance to adopt. These experiments will be continued.

In irrigation experiments with sugarcane, furrow watering was found better than free flooding or the raised bed system of watering.

With potatoes, whole tubers planted at the rate of 1,800 lbs. per acre again gave a much larger outturn than cut sets planted at the rate of 1,200 lbs. per acre. But it is a question whether the larger outturn was the result of planting whole tubers or of using a larger amount of "seed."

With jute no very definite results were obtained in the spacing experiments as the plots were of very unequal quality. But in the experiment made with the object of ascertaining the best stage at which to harvest the crop it seems that, barring the immature crop before flower buds appear and the dead ripe crop when the pods are quite dry, the quality is not seriously affected by the stage of harvest.

In regard to variety experiments, six varieties of sugarcane were tried—three of Bombay and three of Bengal. The Khari variety of Bengal gave more than double the outturn of any other variety. The varieties of jute that gave the best outturn in 1903 did not turn out equally satisfactory in 1904. In the latter year the varieties which did best were—Hewti white of Rangpur; Boran and Barapat of Mymensingh; Kakya Bombai, Barapat and Nailta of Serajganj; Nalpat of Faridpur and the seed selected on the farm during the past 13 or 14 years.

17. *Dumraon Farm.*—An experimental farm was established by the Maharaja of Dumraon in 1885 at Pareswana, a village about two miles west of the town of Dumraon. In 1895, however, Dr. Leather, Agricultural Chemist to the Government of India, pronounced the site unsuitable for experimental work and selected the present site close to the Railway station of Dumraon.

The present farm consists of about 30 acres of land, of which 22 acres are under experimental cultivation. The Dumraon Raj bears all the expenses of the upkeep. During the year under report the total expenditure came to Rs. 2,513 against Rs. 2,545 of the preceding year; and the receipts amounted to Rs. 675 against Rs. 950 of the preceding year. The decrease in receipts was chiefly due to the failure of the sugarcane crop. The nett cost of maintenance by the Raj was therefore Rs. 1,838. The Department is indebted to the kindness of Mr. Mollison for a thorough revision of the cropping scheme of this farm.

The raiyats in Bihar generally burn their cattle-dung using only the ashes for their crops. This involves the loss of the nitrogen, which science regards as the most valuable part of the manure, especially for cereal crops. One of the objects of the manure experiments with paddy and wheat at Dumraon was to fix definitely the money value of the loss caused by this burning. The results so far show that the loss per acre in the case of paddy is over Rs. 6.

The scheme in the manure experiments with paddy and wheat was, except in the case of green manuring, to supply 40 lbs. of nitrogen in various forms. Cowdung (about 100 maunds) gave the best outturn with paddy at the least cost. Saltpetre (11 maunds) was found too expensive and a mixture of bonemeal (6½ maunds) and saltpetre (about 7 maunds) was also found unsuitable on the score of cost. Green manuring, however, either with Dhaincha or Sun hemp at a very trifling cost gave more than double the outturn of the unmanured plot.

With wheat, poudrette gave the best result and green manuring with indigo and sun hemp gave the next best results. Bonemeal (6½ maunds) and saltpetre (4 maunds) cost most and gave the smallest outturn.

Eighteen varieties of paddy from Bengal, Bihar and Bombay were compared side by side under the same conditions. Basful and Maharajwa (both local), Sukhavel of Bombay, "Patnai" and Ran-dhunipagul of Bengal gave the largest outturns and the highest profits. Six varieties of wheat were compared. Australian No. $\frac{121}{20}$ and Red Deshi wheat of the United Provinces were found as in the preceding year to be very satisfactory, but Palestine wheat gave a poor outturn.

Canadian "Welcome" oats seem to be gradually improving by acclimatization.

Cotton proved a failure from excessive rain during July and August and again from severe cold and frost in February. An irrigation experiment was tried with wheat. One watering was found better than two waterings. The subject will be kept in view for further investigation.

18. *Gouripur Farm (Mymensingh).*—This farm belongs to Babu Brajendra Kishore Roy Chowdhury of Gouripur, a zamindar who takes a practical interest in the improvement of agriculture. The farm was started in 1901, but was not placed under the supervision of this Department till towards the close of 1903. The area is 28 acres, of which about 20 are under cultivation.

The most important crops grown on the farm are jute, sugarcane and potatoes. The total receipts amounted to Rs. 1,464 during the year under report and the total expenditure to Rs. 2,732. The nett cost of maintaining the farm therefore came to Rs. 1,268.

Excepting a small patch, the land is not suitable for winter paddy. In the little area suitable for this crop, two varieties of Assam paddy were tried with good results.

In a comparative experiment with varieties of potato, the Patna variety was found far more prolific than the Nainital, the Chirapunji or the local. With the local variety of potatoes it was found that close planting of small seeds without irrigation gave the best outturn. The experiment will be continued.

In another series of plots the proper quantity of cowdung to use for potatoes is being studied, as also the comparative merits of bonemeal and superphosphate.

With jute the only experiment tried was a comparison of varieties, but the crop suffered so much from heavy rain that the results were of little value.

Muzaffarnagar wheat gave a very much better outturn than Gangajali or Dudhia. Jameli wheat gave a very small outturn.

Several varieties of cotton were tried, but they failed from excessive rain and the attack of a caterpillar.

19. *Sripur Farm.*—This farm is maintained by the Hathwa Raj now under the Court of Wards. The chief object of the farm is the improvement of cattle in the Province.

The farm now consists of a block of about 730 acres of land, of which about 33 acres are under experimental cultivation, 560 acres under non-experimental cultivation and 100 acres under paddocks.

The farm has been in charge of Mr. N. N. Banerjee, M.R.A.C., during the last four years.

In the year under report the weather was not at all favourable. From the first week of June to the middle of September there was continuous and heavy rain. The principal *bhadoi* crops suffered severely. For the *rabi* crops too, the weather was most unpropitious. Cloudy and foggy weather in January induced rust in wheat. Then came the heavy frost in February killing or seriously damaging *arhar*, cotton, sweet yams and castor.

Five varieties of maize were tried as in the two preceding years. Although the outturns were for the reasons stated poor, yet the results went to confirm the experience of the previous years that the Juanpur variety is the heaviest and the local red variety the poorest producer. The American (acclimatized) variety has shown itself as a very good second to the Juanpur variety. The local white comes third in point of merit followed by the Cawnpur variety. The Juanpur variety has taken the fancy of the neighbouring raiyats who have been growing it for the last two years.

Five varieties of fodder grasses were also grown for the third time, *i.e.*, (1) Amber Sugar Sorghum (2) Sundhia jowar, (3) Nilwa jowar, (4) Imphee and (5) local jowar. As in the two previous years, the outturn from the local variety surpassed that of the imported varieties. Of the latter, Nilwa gave the best outturn and Sundhia the poorest. Cattle seem to prefer Imphee and Nilwa to the local jowar.

Eight varieties of sugarcane were tested during the year, namely, Poona, Samsara, Khari, Hemja (local) Sonabilli, Betakabu, Vanse and Red Mauritius. The khari variety distinctly maintained its superiority over other varieties. It is not easily damaged by jackals and pigs, caneborers and white ants. It resists drought and can be ratooned with good results for three or four years. It has found favour with the raiyats and is being introduced into several neighbouring indigo factories.

As reported last year, the Conference held at Sripur in 1902 entirely discarded the original idea of improving the local breed by crossing them with superior up-country and foreign breeds. It was laid down that the country breed should be improved by a process of rigorous selection. All bad bulls and cows have been replaced by better animals. New bulls have been captured from time to time and new cows have been purchased from the Barahpur (Shahabad) and Sonepur Cattle Fairs and from Ballia and other

adjoining districts. The breeding herd now consists of 44 cows and three bulls passed for breeding purposes by the Superintendent of the Civil Veterinary Department, Bengal.

Among the various breeds which were purchased from the Hissar Farm and which are now kept only for demonstration purposes, the Superintendent speaks of the Montgomery cattle as having steadily kept up their reputation as milkers and shown themselves as more immune from diseases than all the other breeds kept on the farm. They are good draught animals too, and are reported to be appreciated both by European planters and by native raiyats.

Four Ayrshire cows, one bull and a cow-calf were sent by Government to this farm in 1901 to be acclimatized and maintained till they were ready to be sent off for breeding purposes to other places. Two cows died on the farm, and under orders of Government the bull and one cow were sent to Patna Municipality, and later on one cow was sent to the Bettiah Raj. The only animals of this breed left now on the farm are the cow that came as a calf with her mother and a bull which was born on the Farm. They have mated together, but the results have not been at all favourable. The cow dropped her first calf, and in the following year the second calf died soon after its birth. These animals do not seem to stand the climate well, especially in the hot season. The cows fall off in milk and the raiyats do not care for the male animals on account of their having no hump.

Some Murrah breed buffaloes are kept on the farm. During the year under report the farm bull covered 123 cow buffaloes belonging to the raiyats.

Some Jamunapari goats and Amritsar sheep were also kept. Two he-goats of the Jamunapari breed covered during the year under report 250 she-goats brought by the raiyats.

Since the close of the year it has been decided to dispose of all the cattle except the selected local herd and the Montgomery herd. A stud buffalo will remain and a limited number of sheep and goats.

A cattle exhibition was held on the farm at the end of January. The total number of exhibits of all kinds of animals was 346. The animals did not in all cases come up to the requisite standard of merit for prizes.

Advantage was taken of the Exhibition to show the farm animals and implements to the raiyats. Small coloured hand-bills in English and Hindi were freely circulated showing, by actual figures of outturns obtained on the farm, the superiority of certain imported varieties of crops over the local varieties.

The receipts for the year amounted to Rs. 19,044 and the total expenditure to Rs. 49,420. Endeavours are now being made to manage the farm more economically.

20. *Agriculture Experiments in Government, Wards' and Private Estates.*—As already mentioned, with continuous and heavy rainfall during the monsoon and with unusually severe cold in winter the seasons were unfavourable to agriculture; and when the ordinary crops suffered so much, it is hardly to be expected that new varieties under experiment should give particularly encouraging results. The results, however, such as they were, are briefly given below.

21. *Potatoes.*—In the Patna Division, experiments with the Nainital variety generally gave only tubers of small size. The outturns were also poor excepting in one village in the Narhan Ward's estate where, manured with linseed cake and cattle-dung, two small plots gave an outturn at the rate of 300 maunds and 240 maunds, respectively, per acre. But the experiments were on a very small scale.

In Khurda (Puri) the Patna variety did better than the Nanital. This variety (Patna) also did very well at Angul. The Commissioner attributes its failure at Banki (Cuttack) to negligent cultivation.

In Ranchi about 32 maunds of Patna and Nainital varieties were distributed among selected raiyats. The former variety did very well as in previous years, and is reported to be much better suited to the soil than the Nainital. In some of the encumbered estates in Hazaribagh and in the Nagar Kiari Ward's estate in Manbhum potatoes were successfully cultivated.

Some Nainital seed potatoes were distributed among the khas mahal raiyats in the Rampur Hât subdivision, in Birbhum. It is said that the raiyats thought

that the object of the authorities was to test the fertility of the soil with a view to enhance rent, in consequence of which they deliberately made a failure of the experiment.

On the other hand, about 20 maunds of Patna seed potatoes distributed free of cost among 44 tenants of the Syedpur Trust estate, Khulna, gave outturns varying from 60 to 390 maunds per acre. The experiment was so successful that the Collector thinks potato cultivation will spread rapidly in the district.

Babu Charu Krishna Majumdur of Berhampur who takes a keen interest in agricultural experiments compared the Nainital and Patna varieties on a small scale. The crop was a very promising one when it was overtaken by the cold and frost of February. Yet the results obtained were interesting: from 5 maunds of seed of the Patna variety he obtained an outturn of 50 maunds (ten times), while 2 maunds of seed of the Nainital variety gave only 8 maunds (four times).

In Faridpur khas mahals a comparison of the two varieties also resulted in favour of the Patna variety. This variety has fully established itself in the Government estate of Joypur in Bogra.

The potato crop failed in Noakhali (khas mahals) and Chittagong (Ward's estates) in the Khagra Ward's estate in Purnea and in the Puthia Charani estate in Rajshahi from too much rain immediately after sowing, or from cold and frost later on. It was also unsuccessful in Backergunge khas mahals.

22. *Wheat.*—Fifty maunds of Muzaffarnagar wheat seed were distributed by the Department to all the principal wheat-growing districts of the Province. The same quantity of saltpetre was also distributed for manuring this crop, but the results were very disappointing on the whole. Muzaffarnagar wheat gave better results than the local variety grown in neighbouring plots in Shahabad, but no comparative figures have been reported. In the Government estates in Barh subdivision (Patna) it was sown on different kinds of land. Sown on *diara* lands the outturn was about 4 maunds per acre, while the outturns from seed sown on *tari* (between *diara* and high lands) and *gocura* (close to *busti*) lands were poorer still. In Bihar subdivision (Patna) the outturn was 15 maunds per acre. In the Narhan Ward's estate (Darbhanga) the crop was damaged by frost. In Muzaffarpur (Mahtas Ward's estate) the crop suffered from heavy rains in the early stages, but stood the frost better than the local variety. It seems on the whole to ripen later than the local varieties. In Monghyr, it was tried in two Government estates; the plants promised well at first, but when they came into ear the west wind dried them up. This is the third year that the experiment has been made in the district with imported wheat, and on each occasion the result has been disappointing. On a previous occasion some of the resulting seed was sown in the following year, but a further deterioration was observed. It would seem, the Collector says, that this kind of wheat is not suited to the local conditions in Monghyr.

In the Pakour subdivision (Sonthal Parganas), 10 seers of this seed gave an outturn of 2½ maunds. In view of the unfavourable seasons this was not altogether discouraging.

Distributed between two zamindars in the Kandi subdivision (Murshidabad), 13 seers of seed in one case gave 6 maunds of outturn (18 times), while in the other case from an equal weight of seed the outturn was only 25 seers. The last result is attributed to "lateness of sowing and damage by frost," though one would have naturally expected these causes to have affected both the results equally.

In Pabna, the seed was sown partly in the Sadar subdivision and partly in Serajganj. It succeeded fairly well at the latter station but failed at the former, both the soil and the season being held answerable for the result.

In Malda, distributed in small quantities among the raiyats, it is said to have given fair outturns in some cases, but the colour of the grains is said to have changed from white to red. The severe cold of winter was unfavourable to the experiment, but "several of the men who tried it desire to try it again."

23. *Sugarcane.*—In districts infested by monkeys, jackals and wild animals, or where the white ants and sugarcane borers are bad, the *khari* is probably the best variety to grow. It requires less irrigation and less manuring than

the soft varieties like the *Samsara* or Bombay; it stools freely and can be ratooned for two or three years in succession; but it is a hard cane to crush. For this last reason it has been entirely given up in Bogra where the weak bullocks find it too much for their strength. The *samsara* cane is slowly spreading in that district, as the result of cuttings distributed among the khas mahal rayaits during several years. Both *samsara* and Bombay varieties were distributed during the year among Government estate raiyats in Faridpur, and also successfully cultivated in the khas mahal garden, but the cuttings for the Kalkini estate dried up in transit. The cuttings meant for the Government estates in Gaya also suffered the same fate. The Manager of the Pachette Encumbered estates is trying to introduce the cultivation of canes in those estates. Saharanpur and *samsara* varieties imported from the Madhupur estate (Cuttack) four years ago continued to give satisfaction in the Baramba Tributary State where their cultivation is reported to be spreading among the tenants.

24. *Sumatra tobacco*—(for cigar wrappers) was grown partly under shade and partly in the open at Rangpur under the personal supervision of Babu Ashutosh Lahiri, District Engineer, who takes much interest in agricultural improvements. The idea of growing it under shade comes from America, where tents are put up on wood and wire frame works to cover large fields. At Rangpur, the shade supplied was something like what is commonly used for the betel vines. The portion of the crop outside the shade suffered from frost and insects, but unfortunately the portion under the shade when harvested developed a mildew in the curing shed, the leaves turning black. Samples of the mildewed leaves have been submitted to Dr. Butler, Cryptogamic Botanist to the Government of India, for examination. The curing is taking place under the supervision of the newly-appointed Superintendent of the Experimental Farm, who had been deputed by Government to Burmah and Madras to acquaint himself with tobacco-curing and cigar-making as practised in those Provinces.

Hingli tobacco was successfully cultivated in the Kanakshar Ward's estate in Faridpur.

25. *Other crops.*—The cultivation of *boro* or *summer rice* is being introduced by the Collector of the 24-Parganas into the swampy and water-logged parts of the Magrahat thana in Diamond Harbour. An advance of Rs. 1,000 was sanctioned by the Board of Revenue for the purpose, which was easily recouped by the sale of the seed among the cultivators at cost price. The crop had not yet been harvested at the time of the Commissioner's report.

The Collector of Rajshahi is trying to introduce oats into the district as a staple crop. He sowed some Murshidabad acclimatised oats and also some Bhagalpur oats in his own garden and got an outturn of $6\frac{3}{4}$ maunds and 12 maunds, respectively, from each maund of seed used. Mr. W. E. Taylor of the Bilmary Factory, Rajshahi, also compared *deshi*, "up-country," and Dumraon seeds (the last procured through this Department) and obtained $3\frac{1}{2}$, 5 and 6 maunds of grain, respectively, from each maund of seed sown. Oats were also successful in the Puthia Charani Ward's estate and in the Surkutia Ward's estate in Rajshahi, but were much damaged by wild pigs. Oats were tried in the Narhan Ward's estate in Darbhanga, but the result was unsatisfactory on account of the damage done by frost.

Another crop that Mr. Garrett thinks is very suitable for the light *diara* lands of Rajshahi which are nearly useless for any other crop is *ground nuts*. He obtained 1 maund 3 seers of outturn from 5 seers of seed sown under his personal supervision. This crop was also very successfully grown in the khas mahals of Palamau. Its failure in the encumbered estates of Hazaribagh is attributed to an insect pest.

Juanpur and Kalimpong *maize* were tried in some of the encumbered estates in Hazaribagh, but failed through excessive rain. The Kalimpong variety further suffered from an insect attack.

The Central Provinces *aus* paddy also failed from the same cause in some of the Ward's estates in Chittagong.

The season was similarly responsible for the failure of the American varieties of *cow peas* supplied to the Collector of Purneah.

Patna *cauliflowers* were very successful in the Khagra Ward's estate (Purneah), but the English seeds were a failure. The Collector of Bogra reports

that Rs. 14 worth of English vegetable seeds distributed among selected Khas mahal raiyats were very successful.

26. *Artificial manures*—were tried by the Manager of the Bettiah Raj, but they did not prove of any value. The experiment will be persevered in.

Babu Sital Das Roy of Ghatal in Midnapore tried bone meal as a manure for paddy, and obtained an increase of 50 per cent. in the outturn.

In the Jaipur Government estate in Bogra, two tons of bone dust were purchased at a cost of Rs. 138 and distributed among the tenants for manuring their sugarcane and jute crops. This is a most useful line of work which might be followed in other districts with advantage.

27. *Agricultural Implements.*—According to the Commissioner of Patna there was nothing of novelty or importance, "though some success is claimed for the new *rhea* decorticating machine set up at Dalsingserai."

The Behia cane-mill and *gur*-making pan continued their good work as usual. A few Sibpur ploughs and Planet Junior hand hoes were purchased here and there as the result of demonstrations given at the various agricultural shows. A modification of the Sibpur plough invented by Babu Rajeswar Das Gupta, one of the travelling overseers of this Department, in which the cast iron mould board for inverting the soil is replaced by a wooden mould board and which has the advantage of being much cheaper than the Sibpur plough, is gaining popular favour. A list of the new and improved implements that were tried in Bengal during the year is given in Appendix I.

28. *Locusts and other Insect Pests.*—Flights of locusts were seen in September in some parts of the Siwan subdivision, Saran district, and in thana Dhaka, in Champaran district, but no injury was done to the crops. In Hazaribagh, locusts appeared in thanas Koderma and Chatra of the sadar subdivision and in thana Gawan of the Giridih subdivision. In Koderma no damage was done, but in Chatra about 25 per cent. of the *bhadoi* crops were damaged. In Gawan, the *rabi* crops were damaged to some extent.

In the Jajpur subdivision in Cuttack the *dhcli* and the *gandira* insects attacked the *dalua* and the *baiali* varieties of paddy, respectively, without doing much harm. A kind of insect locally known as *kataqundi* did some damage to paddy in the Sitakund thana of Chittagong in October. In Rangpur, potatoes were damaged by an insect called by the raiyats *ghur-ghuri poka*. In Monghyr, the *lahi* insect damaged the mustard crop of the *diaras*. Some unspecified insects damaged four annas of the crops of the Patna district. Other insects locally known as *fara* did some damage to the gram crop in the Buxar subdivision, Shahabad district. The *lorki* and *lahi* attacked the oil-seed crops in the Siwan subdivision, Saran district. The *bhali* was responsible for some damage to the *urid*, *til* and *mothi* crops in Champaran. The Commissioner of the Patna Division justly complains of the unsatisfactory nature of these reports, and emphasises the necessity of drawing the attention of the District officers to the circular encouraging them to send specimens of these various insects to the Entomologist for identification.

29. The Entomologist to the Government of India held local investigations in connection with sugarcane insects in Saran and cotton insects in North Bihar generally. A bulletin on "cotton in Bihar" with special reference to the insect-pests of cotton has been distributed for the use of planters. In addition a number of leaflets have also been issued by the Entomologist on the use of insecticides.

30. *Sericulture.*—The Bengal Silk Committee continued its work throughout the year. Their report is a record of fairly satisfactory progress in the sericultural operations in the districts of Birbhum, Bogra, Malda, Rajshahi and Murshidabad. The Committee employed overseers and sub-overseers as follows :—

	Overseer.	Sub-overseers.
Birbhum	...	2
Bogra	...	2
Malda	1	5
Murshidabad	1	4
Rajshahi	...	2

These officers work under the direct supervision of a Superintendent employed by the Committee. They are doing something to popularise the use of

healthy seed. It is reported that the rearers now appreciate the advantage of rearing silk worms according to Pasteur's system. Mulberry plantations have been extending in nearly all the silk districts. The Committee sell microscopes and other appliances to cocoon-rearers and the Committee's officers instruct the rearers in the use of the microscope. In the district of Malda a sericultural class in connection with the Jote Arapur Middle English School has been opened. The District Board of Malda has sanctioned a further grant of Rs. 10, and the Silk Committee Rs. 5, a month towards the pay of the sericultural teacher. In addition to the special grant of Rs. 8,000 from the Imperial Government (which will be spent in the current year) the Bengal Government contributed Rs. 6,000 in aid of the sericultural operations conducted by the Bengal Silk Committee during 1904-05.

31. *Crop-cutting experiments.*—In order to gain some definite data as to the advantage of canal irrigation, crop cutting experiments with winter paddy were conducted at Dumraon and at Cuttack jointly by the officers of the Irrigation Department and by my Assistant Director, Mr. D. N. Mookerji. The outturns obtained per acre are tabulated below:—

			Outturn per acre in lbs.		
			Grain.	Straw.	Chaff.
Dumraon ...	1.	Unirrigated ...	800	1,340	70
	2.	Irrigated ...	1,490	2,350	125
Cuttack ...	1.	Unirrigated ...	930	2,211	57
	2.	Irrigated ...	1,279	2,637	79

The results of the crop-cutting experiments conducted in the different districts of these provinces during the year 1903-1904 have been compiled in my office, and will be fully analysed and discussed when submitting the next quinquennial return. Two hundred and thirty-nine experiments on irrigated crops and 976 on unirrigated crops were made. It is proposed to arrange for a larger number of experiments at the next harvesting season jointly with the officers of the Canal Department.

CHAPTER IV.

EDUCATION IN AGRICULTURE AND SERICULTURE.

32. *Agricultural Class at Sibpur.*—There were 14 students in the second-year class on 1st April 1904, against six in the previous year. Of these 14 students, 11 were general and three were special. Out of the 11 general students, 10 passed the final examination. In the first-year class there were 11 students, of whom nine were general and two were special. One of the general students left the College before the annual examination. Of the remaining 10 students, nine passed and were promoted to the second-year class. Fifteen students (eight special and seven general) were admitted to the new first-year class. No special student has up to the present time passed the final examinations of the Sibpur classes. It should be explained that "General" students are graduates in Science, while "Special" students are Entrance-passed men with a declared intention of following agricultural pursuits. Out of the 10 students who passed the final examination, one has been appointed as a Deputy Magistrate and one as a Sub-Deputy Collector, while a third has been temporarily appointed as an Overseer under the Provincial Agricultural Association. I trust that the claims of the other passed students will receive favourable consideration when a regular agricultural service is created in connection with the scheme for reorganizing the department.

33. *Agricultural class attached to the Ravenshaw College and Collegiate School, Cuttack.*—This class was started in June 1904 with 69 students belonging to the College classes and the two highest classes of the school department. But the number fell to 30 in March last at the approach of the University examinations. The students attended theoretical lectures on Agriculture in the College and received practical lessons at the farm. The Farm Overseer at Cuttack is also the Agricultural teacher in the College, and for this additional work he receives an allowance from the Education Department.

34. *Agricultural class in the Chittagong Collegiate School.*—There were nine students on the rolls in March last, against 38 in the preceding year. Some of

the students of the Chittagong National Institution also were allowed to attend the class, but they left after a few months. The Farm Overseer of Chittagong is also the Agricultural teacher at the College and receives an allowance from the Education Department. He gave theoretical instruction in the school and practical instruction at the Farm.

35. *Agricultural Classes in the Gaya Zilla School.*—These classes have been working since March 1903. One hundred and eighty-nine boys, in fact all excepting those in the first and last classes, attend lectures in Agriculture. In the school-garden each boy is allowed a piece of land to grow his own crop.

36. *Agricultural classes in the Dumraon High School.*—Agriculture is taught to the students of the first four classes of this school. One hundred and twenty-five students attended the lectures in Agriculture during 1904-1905. Besides theoretical instruction, practical classes were held in the students' garden. The land in this garden was divided into a number of plots for each class. The students were also taken to the Dumraon Farm almost every week.

37. *Agricultural classes in the Howrah Zilla School.*—Agriculture was taught in the 2nd, 3rd and 4th classes. The Agricultural teacher gave lectures for two hours daily. The instruction imparted was mainly of a theoretical character, as no arrangement could be made for practical training at the Sibpur Farm.

38. *Agricultural classes in the Burdwan Municipal School.*—About 50 boys of the first four classes of the school regularly attended the Agricultural lectures during the year. The Agricultural teacher taught for one hour daily. Occasionally the boys were taken to the Raj Experimental Farm for practical instruction.

39. *Rajshahi Diamond Jubilee Industrial School.*—The school now consists of three departments, namely, sericultural, weaving and technical. The Sericultural Department teaches: (1) mulberry cultivation; (2) detection and prevention of silkworm diseases and pests, including microscopic selection of seed; and (3) rearing of Indian and foreign silkworms. The school has now a 5-acre mulberry garden. The cocoons grown in this school are gaining popularity among the village cocoon-growers who buy them for seed. This papularity is due to the fact that the school cocoons are free from disease.

The training in the weaving department consists in imparting practical lessons in (1) reeling of silk, (2) spinning of silk waste, (3) the analysis and textile use of fibres usually employed in the silk industry, and (4) bleaching and weaving of silk, silk wastes and mixed fibres.

The Technical Department which was started in January 1905, teaches surveying to the Amin class students and carpentry and engineering to "B" class students of the Rajshahi Collegiate School.

The teaching staff of the school consists of one Superintendent, who is in direct charge of the Technical Department, one head master, who teaches sericulture, and one Carpenter Instructor, who teaches the "B" class. In the Weaving Department professional weavers are employed who show weaving to the students. One Serampore fly-shuttle loom is also worked in this department. Altogether 37 students (27 Hindus and 10 Mahomedans) obtained admission into the school, of whom nine joined the Sericulture Department, two the Weaving Department, and 26 the Technical Department.

Two half-yearly examinations of the Sericulture branch of the school were held—one in June, and the other in December and January. In the first half-yearly examination, none of the students passed. In the second examination eight students appeared, of whom two passed in the first division and one in the third. Eight scholarships of Rs. 5 each a month were granted by the District Board of Rajshahi, three of Rs. 10 each a month by the District Board of Mymensingh, and one of Rs. 7 a month by the District Board of Malda. There is no tuition fee charged for the Sericultural and Weaving Departments. A tuition fee of Rs. 2 a month is, however, realised from the students of the Technical branch of the school.

The school is under the management of a Committee of the District Board of Rajshahi, with Babu Kumadini Kanta Banerji, Principal of the Rajshahi College, as its Honorary Secretary.

The District Board of Rajshahi made a grant of Rs. 1,200, and this Department Rs. 500 to the school. The total receipts including the sale-proceeds of cocoons amounted to Rs. 2,385, which was sufficient to meet the current expenditure of the school.

40. *The Sabang Seri-Agricultural School, Midnapore.*—The pupils in this school were taught, among other things, the cultivation of mulberry, the microscopic examination of seed, the rearing of foreign and indigenous silk-cocoons and of Endi cocoons and the preparation of silk filaments. A small nursery is being built in connection with the school. There is a garden attached, where various crops were cultivated, including potatoes, in which the local raiyats are said to have taken considerable interest. The result of the examination of the school was satisfactory, but the number of students decreased during the year. This was probably due to the absence of the teacher for two months. In order to extend the usefulness of the school, the Managing Committee have decided that the Sericultural teacher should instruct the boys of the local minor school, in addition to those of his own class, in Sericulture and Agriculture. It was also decided to sell the best seed-cocoons at the ordinary price to the local rearers. The boy who stood first at the final examination this year has been granted a scholarship of Rs. 10 a month to complete his Sericultural education at Rampur Boalia. When he returns he will be given about Rs. 150 worth of appliances to enable him to start a nursery of his own.

CHAPTER V.

PUBLICATION OF AGRICULTURAL INFORMATION, &c.

41. Leaflets on cotton and potato cultivation, on the cultivation and curing of cigar-leaf tobacco, and on the principles of seed selection were printed for distribution during the year under report. The important results of manure experiments with paddy at the Burdwan Farm were printed in the form of a notice, both in English and Bengali and widely distributed for general information.

42. The usual preliminary and final forecasts on the various staple crops of the Province were issued from time to time during the year, and the agricultural statistics of the previous year were compiled and published. The prescribed consolidated table showing the average prices of food-grains, &c., in Bengal during 1903-04 was also prepared and issued, and the Season and Crop Report for the year 1903-1904 was published.

CHAPTER VI.

FINAL.

43. *Emigration to Burma.*—The number of State emigrants carried from Bihar to Burma during the year under report was 421 (340 adults and 81 children), against 457 in the previous year. The emigrants are carried to Burma at reduced rates by the British India Steam Navigation Company and one-third of the passage-money is paid as a subsidy in equal shares by the Governments of Bengal and Burma.

44. *Agricultural Exhibitions.*—A brief account of each of the agricultural exhibitions and cattle fairs held in this Province during the year under report is given in Appendix II. Rupees 2,650 were distributed in aid of some of these exhibitions. These exhibitions and cattle fairs are doing useful work and their number is increasing every year. I have applied to Government for an increased grant under this head, and I am trying to arrange for a collection of selected agricultural exhibits to be taken to the various shows. The Agricultural Associations, which are now being formed throughout the Province, will find much scope for their energies in the organization of agricultural exhibitions.

45. *Provincial Museums.*—A Natural History Museum was started at Darjeeling in 1903-1904. Additions have been made to all sections in the Museum during the year. It is under the management of a Committee with the Deputy Commissioner as its President.

There is also an Agricultural Museum at Dumraon under the supervision of the Overseer of the Dumraon Experimental Farm. The Deputy Director of Agriculture has recently favoured me with some valuable suggestions for the improvement of this Museum. As mentioned in another place, a small

Agricultural Museum has also been opened at Monghyr as an outcome of a successful Agricultural Exhibition.

46. *Miscellaneous Experiments and Enquiries.*—The cost to Government of agricultural experiments and miscellaneous enquiries conducted under the direct supervision of this Department during the year under report amounted to Rs. 12,260 against Rs. 10,871 expended in the previous year. The details of the expenditure will be found in Appendix III.

47. *Agricultural Associations.*—His Honour the Lieutenant-Governor inaugurated the Bengal Provincial Agricultural Association at a meeting held at the Belvedere on the 26th August 1904. The object of establishing this Association is "to secure for Government the co-operation of men interested in agriculture and in industry." The Member of the Board of Revenue in charge of Land Revenue and Court of Wards administration is the *ex-officio* President, and the Director of Agriculture is the *ex-officio* Secretary of the Association. Leading zemindars and business-men, numbering 33 at present, are its members. The Association meets at Writers' Buildings, Calcutta, where the office of the Director of Agriculture is located. A library is being formed for the use of the members of the Association which will include the best books of reference dealing with agricultural and industrial subjects.

A Divisional Agricultural Association was formed at Calcutta and a District Association was formed at Rangpur during the year under report. More Divisional and District Associations are being formed during the current year. These Associations will work in co-operation with the Provincial Association. Government is giving financial aid to the Associations.

48. *Indigo.*—During the year under report Government continued its annual grant of Rs. 50,000 for Research work in Indigo. A site for the new station has been selected at Sirsiah and the buildings are progressing well. The factory will be ready for the *Mahai* of 1905. The present staff consists of Messrs. Bergtheil, Finlow, Briggs and Macgregor. Experiments have been carried on with Java-Natal and Java-acclimatized indigo-seed, and a small Seed Farm has been started at Dasna Factory in Meerut. Everything points to the conclusion that the Java seed is an established success. An excellent and cheap machine for preparing the seed has been invented by Mr. Watson, who has been recommended for the Government reward. An account of the Research work in indigo carried out at the Dalsingserai Research station in 1903 and 1904 under the direction of Professor Bloxam has been published.

49. As I was in charge of the Department for less than a week during the year under report, I refrain from making remarks regarding the working of officers during that year.

I have the honour to be,

SIR,

Your most obedient servant,

N. D. BEATSON BELL,

Offg. Director of Land Records and Agriculture, Bengal.

APPENDIX I.

A list of Agricultural Implements and Machine which have been tested in Bengal during the year ending 31st March 1905 and of those in use which are reported to have met with more or less success.

Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by native agriculturists.	REMARKS.
2	3	4	5	6	7	8	9	10
			Rs. A. P.					
Behia Sugar cane Mills.	Crushing sugar-cane.	Yields best and highest outturn.	58 0 0 to 90 0 0	Messrs. Thomson and Mylne of Behia, Shahabad.	Commissioners of the Rajshahi, Chittagong, Patna and Orissa Divisions.	An efficient machine for extracting juice from sugarcane. The cultivators have been able to appreciate it.	.....	
Shallow evaporating pan.	Boiling sugar juice.	Ditto ...	30 0 0	Ditto ...	Commissioners of the Patna and Orissa Divisions.	The cultivators appreciate the value of the pan.	.....	
Sibpur plough	Tilling lands and soil inverting.	Cheap,, found well for *rabi* crops.	10 0 0	Department of Land Records and Agriculture, Bengal, Calcutta.	Commissioners of the Rajshahi, Patna, Bhagalpur and Orissa Divisions.	The plough was tested with success.	.....	
Hindustani plough.	Tilling ground	Worked by hand and bullock.	20 0 0	Messrs. T. E. Thomson & Co., Calcutta.	.....	.....	30 sold during the year.	
Planet Junior's hand hoe.	Cultivating ...	Worked by hand ...	25 0 0 to 40 0 0	Ditto ...	.....	.....	42 sold during the year.	
Interculturing harrow.	Hoeing maize and other crops when six inches high.	Economical	2 0 0	Agricultural Department, Bombay.	Commissioner of the Patna Division.	.....	.....	
Intercultur e bullock hoe.	Hoeing between rows of standing crops.	Effective	.....	Ditto, or Siripur Farm, Hathwa.	Ditto ...	Recommended as cheap and light.	.....	
Bakhar (paring plough.)	Stirring subsoil and levelling and killing weeds.	Well serves the purpose for which it is intended.	2 8 0	Agricultural Department, Bombay.	Ditto ...	.....	.....	
Seed drill ...	Sowing seed at equal depth.	Sowing done easily ...	5 0 0	Ditto ...	Ditto ...	.....	.....	
Ditto ...	Sowing seeds in lines.	Distributes seeds evenly and facilitates subsequent weeding.	.....	Ditto, or Siripur Farm, Hathwa.	Ditto ...	Recommended as cheap and light.	.....	
Indigo drill ...	For sowing indigo and other seeds in line.	Can be modified for sowing of different kinds of seed in addition to indigo.	.....	Indigo Factories or Siripur Farm, Hathwa.	Ditto ...	Useful when sowing is done on a large area.	.....	
Combined plough and seed drill.	Sowing cotton	.....	5 0 0	Made in Champaren from Bombay sample.	Ditto ...	.....	.....	
Threshing machine.	For threshing crops.	Worked by hand ...	250 0 0	Messrs. T. E. Thomson and Co., Calcutta.	.....	.....	2 sold during the year.	
Ditto ...	Ditto ...	Worked by steam power.	3,500 0 0	B. A. Reed & Co., Aberdeen, Scotland.	Commissioner of the Patna Division.	Well recommended for large farms.	.....	
Reaping machine.	Cutting oats, wheat, &c.	Work done quickly ...	500 0 0	Messrs. Macbeth Bros & Co., Bombay.	Ditto ...	Useful for large farms.	.....	
Winnower ...	Dressing corn and cereals.	Worked by hand ...	225 0 0	Messrs. T. E. Thomson & Co., Calcutta.	.....	.....	6 sold during the year.	

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by native agriculturists.	REMARKS.
1	2	3	4	5	6	7	8	9	10
17	Chaff cutter...	Chaffing fodder	Worked by steam power.	Rs. A. P. 465 0 0	Messrs. T. E. Thomson & Co., Calcutta.	.....	.....	4 sold during the year.	
18	Ditto ...	Ditto ...	Worked by bullock gear.	255 0 0	Ditto ...	.....	.....	Ditto.	
19	Ditto ...	Ditto ...	Worked by hand ...	105 0 0 to 200 0 0	Ditto ...	.....	.....	10 sold during the year.	
20	Ditto ...	Ditto ...	Ditto ...	45 0 0 to 65 0 0	Ditto ...	.....	.....	95 sold during the year.	
21	Iron *dones* ...	Lifting water from small depth.	Light and durable ...	8 0 0	Rampurhat, District Birbhum.	Commissioner of the Patna Division.	It is approved by the cultivators.	.....	
22	Corn crusher	Crushing corn and shellac.	Worked by hand ...	150 0 0	Messrs. T. E. Thomson & Co., Calcutta.	.....	.....	62 sold during the year.	
23	Donaldson's patent oil mill.	Crushing oil seeds.	Effective	120 0 0	Messrs. Jessop & Co., Calcutta.	Commissioner of the Patna Division.	An efficient substitute for wooden ones.	.....	
24	Assam cotton gins.	Separating lint from seed.	Effective and economical.	12 0 0	Department of Land Records and Agriculture, Bengal, Calcutta.	Ditto ...	Well recommended to the cotton cultivators.	.....	
25	Decorticator...	Decorticating rhea fibre.	Automatic ...	6,000 0 0	Bengal Rhea Syndicate, Calcutta.	Ditto ...	.....	.....	

APPENDIX II.

Agricultural Exhibitions.

1. *The Bhola Diamond Jubilee Fair.*—This fair was started in 1887 at Bhola, district Backergunge. It is held in the month of January. This year a Sibpur plough and a "Planet Junior" hand-hoe were sent by this Department to the exhibition. The cultivators present are said to have been interested in these implements, but the general opinion was that they were rather too costly for an average raiyat.

2. *The Dumka Exhibition.*—This exhibition lasted this year from the 26th to the 30th January. Live-stock, agricultural produce and manufactured articles were exhibited. A sum of Rs. 467-8 was given away as prizes to the exhibitors. The expenses were entirely met from private subscriptions.

3. *The Khulna Agricultural Exhibition.*—The Khulna Exhibition and Cattle Show lasted from the 10th to the 19th February. The Cattle Show is a new feature of this exhibition. Prizes in money, medals and certificates were awarded to the producers or manufacturers of articles. A sum of Rs. 463-8 was given away in prizes. Government contributed Rs. 200 in aid of the exhibition, and two silver medals were also given to the Cattle Show. The prize distribution was held on the 16th February 1905, at which the Hon'ble Mr. Savage presided. The Deputy Director of Agriculture was also present on the occasion. With the saving from the Coronation Exhibition Fund the Committee have started a dairy which has been placed in charge of a qualified Veterinary Assistant.

4. *The Faridpur Agricultural Exhibition and Méla.*—This exhibition and *méla* lasted from 9th January to the 26th February. The *méla* is popular and is resorted to by a large number of people from the interior. Pady, vegetables, sugarcane, tobacco, hardware, and country cloth, etc., were exhibited. Government contributed Rs. 200 in aid of this exhibition. An Overseer of this Department, who was deputed with some improved agricultural implements and dairy machines to this show, demonstrated the use of these implements to the raiyats present. Rupees 342 were given away in prizes.

5. *The Barahpur Agricultural, Cattle and Horse Show.*—This show was held on the 4th and 5th of March. The Judges were Messrs. Smith and Mookherji of this Department and a local zemindar. Rupees 150 from the Provincial Fund, as well as Rs. 100 and two silver medals from the Imperial Fund, were offered in aid of this exhibition; but money and

medals from the Imperial Fund could not be fully distributed, owing to the absence of eligible exhibits. The Imperial rules contain somewhat strict conditions.

6. *The Midnapore Exhibition.*—An Agricultural and Industrial Show was held in the town of Midnapore on the 9th February 1905. This is the first exhibition of its kind in this district. Cattle were also exhibited, but they were poor in quality and few in number. The exhibits in the Agriculture section included an excellent collection of paddy and husked rice. The silk fabrics of Ghatal and the tussar goods manufactured in certain parts of the Sadar subdivision were greatly appreciated. Some fine mats (*maslands*) were also exhibited. It will be remembered that the local manufacturers of these mats were awarded medals at the London and Paris Exhibitions as well as at the International Exhibition held in Calcutta in 1883. The brass and bell metal wares of Kharar in the Ghatal Subdivision and Chandanpur in Contai deserve favourable mention.

Eleven silver medals were awarded by the Committee and seven by private gentlemen. The total number of money prizes given away was 210 of the aggregate of Rs. 1,000, and 135 certificates of merit were also granted. The expenditure was entirely met from local subscriptions.

A satisfactory feature of this show was that zemindars took considerable personal interest in exhibiting their goods and had no hesitation in competing with their tenants.

7. *The Khagro Méla and Cattle Show.*—The Cattle Show in connection with the Khagra *mela*, which was held on the 26th January 1905, excited considerable interest among the large crowds that attended the *méla*. The competition for prizes was very keen. Excellent bullocks, Bhutia ponies and buffaloes were exhibited. Rupees 100 were paid from the Imperial Fund and Rs. 200 from the Khagra Estate for prizes at the cattle show. Elephants, buffaloes and Bhutia ponies had a brisk sale during the *méla*.

8. *The Siripur Cattle Show.*—A Cattle Show was held at the Siripur farm under the patronage of the Hathwa Raj on the 23rd and 24th January 1905 with a view to give a stimulus to the improvement of the local country breeds of cattle in the Saran district and specially in the Hathwa Raj. Two silver medals were offered as prizes by this Department, but they were withheld owing to the exhibits not being sufficiently good. A sum of Rs. 255 was given away in prizes by the Raj. As this is the first year of the Cattle Show in this district, it is hoped that the exhibits next year will be larger in number and better in quality. The farm animals, improved agricultural implements used at the farm and some farm produce were also exhibited. Leaflets printed in Hindi and English showing very briefly the results of the experiments made on the farm during the last three years with different varieties of crops were distributed freely to cultivators and other visitors to the exhibition. Besides Government officials, several European planters from the neighbourhood visited the show.

9. *The Agricultural and Cattle Show at Purulia.*—With a view to improve the agriculture and various other industries as well as the local breeds of cattle in the district of Manbhum, the District Board has resolved that an exhibition is to be held annually at Purulia. An exhibition committee with the Deputy Commissioner as its head was formed, and subscriptions were raised from private persons; Rs. 200 was paid by the District Board and Rs. 300 by Government. Prizes amounting to Rs. 361 were awarded for cattle, tussar silk, weaving, cutlery, agricultural implements, poultry, ponies, vegetables, and for cotton and lac (raw and manufactured). The exhibition was opened on the 2nd February 1905, and lasted for four days. About ten thousand people visited the show. An Overseer of this Department demonstrated the working of the Sibpur plough to the cultivators present.

10. *The Sonepur Horse and Cattle Fair.*—This fair began on the 15th November and closed on the 3rd December 1904. The Cattle Show took place on the 22nd November, *i.e.*, a day before the bathing day." Rules and prospectus for prizes awarded from the District and Imperial Funds were printed both in English and Hindi and published in all districts of the Patna Division. The estimated number of animals brought into the *méla* was as follows :—

Elephants...	950	Cows	1,425
Bullocks	25,600	Horses	2,355
Ponies	3,500	Buffaloes	850
Camels	39	Birds	3,000

Of these, about 800 elephants, 900 cows, 4,000 horses and ponies, 20,400 bullocks, 600 buffaloes and 2,400 birds were sold. A committee, consisting of the Collector of Saran, the Superintendent of the Civil Veterinary Department, Bengal, and three other European gentlemen, was formed for judging the cattle and awarding prizes to successful competitors. The Imperial Government contributed Rs. 150 and the Provincial Government Rs. 200 in aid of this show. Altogether 29 prizes were awarded from Provincial and Local sources at a cost of Rs. 405 and three prizes from the Imperial grant at a cost of Rs. 27. The unspent balance of the Imperial grant was refunded to Government.

11. *Rajnagar Cattle Show.*—This Cattle Show has been in existence now for two years. A *méla* has been started in connection with it to attract more people and to give it a permanent character. The competition for prizes was not very keen. The Imperial prizes were not awarded, as there was no suitable exhibits. Rupees 200 was paid by Government from the Provincial Fund in aid of this exhibition. The Superintendent of the Civil Veterinary Department was present at this show and helped the Judging Committee with his advice.

12. *Suri Cattle and Produce Show.*—This show was opened on the 21st January 1905 by the Commissioner of the Burdwan Division and lasted for six days. A vernacular notice had been widely circulated, and private subscriptions amounting to Rs. 3,140 had been collected. Government contributed Rs. 200 from the Provincial Fund in aid of this exhibition. Rupees 150 was also sent to the Exhibition Committee as an Imperial grant for special prizes for cattle. The Deputy Director of Agriculture, an Assistant Director and an Overseer of this Department attended this show. The Overseer exhibited some improved agricultural implements and some seeds, manures, etc. A Sibpur plough was purchased from this Department and given to a raiyat as a prize, in order to popularise the use of these implements amongst the raiyats. In future the Committee intend to distribute seeds and agricultural implements in as many cases as possible instead of money prizes. It is satisfactory to notice that after meeting all the increased expenditure there is a balance of Rs. 409-7-3 this year. Out of this balance, it has been decided to purchase two bulls for breeding purposes.

13. *Bihta Agricultural Show.*—The show was held on the 4th March 1905 at Bihta in connection with *Sivaratri méla.* Notices containing information about the date of the show and the classes of cattle, etc., to be exhibited were printed in English, Hindi, and Urdu and distributed in Patna and the neighbouring districts. Rupees 100 were paid from the Provincial Fund in aid of the show and Rs. 150 and two silver medals as an Imperial grant in the shape of special prizes for cattle. The Imperial money was distributed by the Superintendent of the Civil Veterinary Department, Bengal, who was present at the show, but the two Imperial medals were not awarded, as none of the animals were considered up to the standard. The Deputy Director of Agiculture also attended this show.

14. *Monghyr Agricultural and Industrial Exhibition.*—An Agricultural and Industrial Exhibition was held at Monghyr, and was opened by the Commissioner of the Bhagalpur Division on the 19th February 1905. The Collector was the President of the Executive Committee. Live-stock, agricultural produce, implements and machinery, as well as works of art and industry, were exhibited. A small piece of ground was used for the purpose of showing the result of different manures on barley, castor, gram, etc. A fly-shuttle loom, a Murshidabad silk embroidery loom and a carpet loom from Bucktiarpur were shown working at the exhibition. About 35,000 people passed the gate, but no gate money was charged. Government contributed Rs. 250 in aid of this exhibition. The Exhibition Committee have started an agricultural museum on a small scale with the surplus money of the Exhibition Fund. Altogether 21 silver and 14 bronze medals were awarded besides Rs. 800 in money. The exhibition is considered to have been very successful. One of the Assistant Directors attended the exhibition and addressed the raiyats on agricultural improvements.

15. *The Baraset Agricultural Exhibition.*—This exhibition was held on the 8th, 9th and 10th February 1905. The number of agricultural and horticultural exhibits was 141. Seeing that the area from which exhibits were accepted was limited to the Baraset Subdivision, this number is fairly satisfactory. It is proposed to abolish the area-limit in future. An Overseer of this Department attended this show with some improved agricultural implements and demonstrated their use. Government contributed Rs. 100 from the Provincial Fund in aid of this show.

16. *The Kalimpong Exhibition and Fair:*—The Kalimpong *méla* was held on the 23rd and 24th November 1904 and was the 14th *méla* of its kind. The position of Kalimpong makes it a convenient meeting place for the inhabitants of Nepal, Bhutan and Sikkim, Tibet and British India. Ponies, mules, cattle, sheep, goat, poultry, grains, roots, vegetables, dairy produce, forest produce, etc., were exhibited as in former years, and the general quality of the exhibits was good. Altogether 356 prizes to the value of Rs. 1,327 were awarded. The Imperial Fund contributed Rs. 300 in cash and two silver medals as special prizes for the improvement of cattle breeding, while Rs. 500 were granted by the Provincial Government in aid of the general expenses of the fair.

17. *The Falakata Fair, Jalpaiguri.*—This fair commenced on the 9th February and lasted till the 1st March 1905. The average daily attendance was 350 against 300 in the previous year, and the number of shops was 102. The value of the articles imported and sold was Rs. 74,500 and Rs. 38,000, respectively. An Agricultural Exhibition was started this year in connection with the fair which promised to be a success. An Overseer of this Department attended the exhibition and explained its usefulness to the people. Government contributed Rs. 200 to this fair.

18. *The Rajabhatkhawa (Jalpaiguri) Fair.*—This fair was removed from Santrabari during the year. It was held from the 14th to 20th March 1905, and due publicity was given to attract people from various quarters. It was attended by a fairly large number of Bhutia and up-country coolies and shop-keepers from Cooch Behar and other places, but no shop-keepers came from Bhutan. It has been reported that the fair was on the whole more successful than when it was held at Santrabari. The Subdivisional Officer of Alipur Duars proposes to remove it again to Hansmara on the Public Works Department road from Rajabhatkhawa to Jaigoon, in the hope of getting support of some of the Tea-planters. A sum of Rs. 200 was paid by Government to this fair.

19. *The Angul Exhibition.*—An Agricultural and Industrial Exhibition was held at Angul on the 16th December 1904 and lasted for three days. The exhibition was opened by the Divisional Commissioner, Mr. Growse. The neighbouring Chiefs, Managers and Dewans of Native States and the leading raiyats were present. There were 1,092 exhibits, of which 742 were agricultural produce and 350 represented the various industries of the district and of the Native States. A fly-shuttle loom was worked at the exhibition and

sugar-cane juice was extracted by a Behia mill. Prizes to the number of 263 and the value of Rs. 500 were awarded to 160 persons.

20. *The Edward Coronation Exhibition, Rangpur.*—A combined Industrial and Agricultural Exhibition was held in the Town Hall compound under the supervision of the Rangpur District Board. The exhibition was opened by the District Magistrate on the 10th February 1905 and was kept open for ten days. The object of holding this exhibition was to stimulate the industries and the growth of indigenous products of the district. There was a large attendance. A fly-shuttle loom and improved agricultural implements were exhibited, and their workings were explained to the raiyats. Rupees 409 were distributed in prizes among the successful exhibitors.

21. *General.*—Taken as a whole, the reports of the Agricultural Exhibitions are a most encouraging feature in the agricultural development of the Province. They have a great future before them.

APPENDIX III.

Expenditure on Miscellaneous experiments and enquiries made by the Department.

	Rs.	A.	P.	Rs.	A.	P.
Experiments other than those made in experimental farms.						
Seeds		...		690	11	5
Cost of seed potato	82	3	6			
Ditto cotton seeds	69	11	4			
Ditto tobacco seeds	18	9	7			
Ditto Muzaffarnagar wheat seed ...	148	4	3			
Ditto other seeds	371	14	9			
Total ...	690	11	5			
Manures—		...		520	12	6
Cost of saltpetre	389	3	0			
Ditto bonedust	120	0	0			
Ditto other manures	11	9	6			
Total ...	520	12	6			
Implements—		...		635	1	0
Cost of winnowing machine	150	0	0			
Ditto Baldeo water-lift	49	7	0			
Ditto cotton gins	70	0	0			
Ditto chaff-cutter	31	2	0			
Ditto cream separator	148	0	0			
Ditto butter churn	49	8	0			
Ditto butter worker	39	8	0			
Ditto hydronette	43	8	0			
Ditto hand-hoes	45	0	0			
Ditto other implements	9	0	0			
Total ...	635	1	0			
Pay and travelling allowance of Travelling Overseers—		...		6,510	9	3
Pay	3,555	0	0			
Travelling allowance	2,955	9	3			
Total ...	6,510	9	3			
Miscellaneous including Rs. 1,262-6 for actual conveyance charges incurred by the Agricultural students during practical training		...		3,903	6	7
Total		...		12,260	8	9

B. S. Press—18198—600—18-8-1905—J. A. M. & others.

AN ACCOUNT OF THE SCIENTIFIC INVESTIGATIONS ON INDIGO WHICH HAVE BEEN AND ARE BEING CONDUCTED IN INDIA.

Scientific work connected with indigo commenced in India in 1898. During 1897 a marked drop in the prices of natural indigo took place owing to the commercial production and competition of synthetic indigo, and a body called the Indigo Defence Association was formed by some of the proprietors of indigo concerns in Behar to protect their interests. This body was subsequently amalgamated with the Behar Indigo Planters' Association. They decided to obtain the best scientific advice possible, and their choice fell upon Mr. Christopher Rawson of Bradford. This gentleman arrived in India in June 1898 and commenced his experimental work in a small laboratory which had been fitted up at the Tirhoot Planters' Club in Muzaffarpur. The outcome of the work of that season resulted in an arrangement being entered into with Messrs. Collingridge, and a laboratory and experimental vats were built at their factory, Mosheri, and the work was carried on there by Mr. Rawson during the manufacturing seasons of 1899 and 1900.

During these same years (1898—1900) certain Bihar planters formed the "Indigo Improvements Syndicate," whose object was to conduct experiments in the cultivation of indigo and other crops of interest to the indigo planter. An agricultural chemist, Mr. Hancock, was retained, and he worked at Dalsing Serai under the auspices of Mr. Bernard Coventry.

The Government of Bengal first rendered monetary assistance to these enterprises in November 1900, when a grant of £500 per annum for three years was made to the Behar Indigo Planters' Association to provide the services of a bacteriologist. In 1901 both the Behar Indigo Planters' Association and the Indigo Improvements Syndicate asked Government for aid in their work, and a grant of Rs 50,000 per annum for a period of three years was made on the condition that the planters found a sum of Rs. 75,000 yearly for the same period, and that the work was conducted by the Behar Planters' Association and the Indigo Improvements Syndicate jointly. These two bodies accordingly amalgamated during 1901, and Mr. Rawson removed to Peeprah, a large factory in the Champaran District, where a new laboratory and an experimental factory had been arranged for him, whilst work was carried on at Dalsing Serai by Mr. Hancock with the assistance of a biologist Mr. H. M. Leake.

In 1902 the present writer joined Mr. Rawson as bacteriologist at Peeprah, and extensive experiments bearing on indigo manufacture were conducted there; meanwhile Mr. Leake, the biologist, was alone at Dalsing Serai, Mr. Hancock having left India at the end of 1901. In March 1903 Mr. Rawson left India, and the present writer returned to Mosheri, where Mr. Rawson's early experiments had been conducted until March 1904. The laboratory there had, however, been dismantled in the meanwhile, and work had to be conducted in a small godown.

During 1903 the Bengal Government gave their grant of Rs. 50,000 to Mr. Bernard Coventry to further the work he had been conducting at Dalsing Serai. Professor Bloxam was engaged and carried on work there, together with Mr. Leake, until March 1904, when both of these gentlemen left India. In 1904 the grant of Rs. 50,000 was again made to the Behar Indigo Planters' Association, but unconditionally. An effort was made to once again resume work at Mosheri Factory, but a satisfactory arrangement could not be entered into with the proprietors. A lease was therefore taken of a disused and dismantled factory at Sirsiah, near Muzaffarpur, and an experimental factory, laboratory, &c., have been under construction there during the past year. All the fittings, apparatus, &c., purchased by the Behar Indigo Planters' Association and the Indigo Improvements Syndicate, both independently and under grants from Government, have been removed to Sirsiah, and work is at present in progress there.

Much valuable information has been obtained during the seven years these investigations have been in progress, but the work as a whole has naturally suffered from lack of continuity and co-operation on the part of the workers. The object of all the work has, of course, been to increase the amount of indigo obtainable from a unit area of land, and it has naturally divided itself into two main sections—the first dealing with the purely agricultural aspect of the case, such as the increase of plant obtainable from the unit area of land or the production of a plant richer in potential colouring-matter; and the second with questions involved in the manufacture of the finished product from the plant. During his five years' work Mr. Rawson dealt with both aspects of the case, and the main results of his investigations are summarised in his final report to the Behar Indigo Planters' Association published in 1904. On the agricultural side much useful information was obtained as to the composition of Behar soils and their response to manurial treatment. As a general rule the soils examined were found to be deficient in available phosphoric acid, and to respond remuneratively to treatment with superphosphate or bone-meal or other phosphatic manures. Nitrogenous manures were generally found useful when applied in conjunction with phosphates. These same conclusions were arrived at by Mr. Hancock working under Mr. Bernard Coventry at Dalsing Serai in 1901 (*vide* Indigo Report to Indigo Improvements Syndicate by Mr. B. Coventry

for season 1901). Mr. Rawson lays stress on the anomalies which occur in the results of the manurial experiments carried out both by himself and by Mr. Hancock (plots taken in the same field giving in several cases entirely different results under one manurial treatment), and expresses the opinion that "much more work is still needed before one can be justified in drawing general conclusions as to the kind and quantity of manures to be applied in order to obtain remunerative returns." The manurial value of the refuse plant, or "seet," obtained in the manufacture of indigo was very thoroughly investigated by Mr. Rawson, and the conclusion arrived at was that in many cases it was as valuable as the indigo produced by a factory or even more so, an opinion shared by most planters in Behar to-day. A method was also devised by Mr. Rawson for determining analytically the potential colouring-matter in the plant and several facts of value established by its use. It was shown that the leaves were the only portion of the plant from which an appreciable amount of dye can be obtained, and the stage of growth of the plant at which the content of the leaves in the dye-yielding principle is at its highest was established. The leaves of several indigo-bearing plants were analysed, and it was conclusively shown that those of the Java variety of indigo contain more potential colouring-matter than do those of the plant ordinarily cultivated in Behar.

On the manufacturing side Mr. Rawson's experiments were most complete. Every stage of the process was investigated from the purification of the water used in steeping to the drying of the finished indigo. His recommendations are summarised in the report referred to above, and detail cannot be gone into here. In the writer's opinion, if Mr. Rawson's recommendations are followed there can be nothing further to be desired in the purification of water, the oxidising process and the after treatment of the crude indigo. In the steeping process there may still be scope for improvement, and this will be touched upon later. As a conclusion to his final report, Mr Rawson remarks as follows:—"Finally, any further aid (from a technical point of view) to improve the position of the indigo industry can only come, in my opinion, from improvement of the plant by natural selection or by the introduction of some other species (such as Natal plant) capable of yielding a greater amount of colouring matter."

From this last quarter aid has already come. The Java plant, which was first brought prominently to the notice of planters by Mr. H. Bailey, who visited Java on behalf of the Indigo Improvements Syndicate in 1899, has proved itself of the greatest value to the Behar planter, and its cultivation is spreading as rapidly as the seed supply forthcoming will permit. In a very few years this plant will, no doubt, have almost entirely replaced the variety formerly grown in Behar. It was first grown on an extended scale by Mr. Bernard Coventry at Dalsing Serai, and its advantages were apparent immediately certain difficulties in its cultivation had been overcome. The chief of these was the possession of a hard coat by the seed of the plant which rendered germination very difficult. It was suggested by the writer in 1902 that this difficulty might be overcome by suitably scarifying the seed in a similar manner to that practised on clover and other hard seeds in other countries. The idea was taken up and proved feasible by Mr. H. Leake, the biologist to the Indigo Improvements Syndicate, and a machine has now been invented and patented by Mr. G. F. Watson of Messrs. Arthur Butler & Co., Muzaffarpur, by which the operation may be performed on a large scale with perfect success.

Mr. Leake's work at Dalsing Serai was mainly devoted to an enquiry into the sources of supply of the indigo seed ordinarily used in Behar. Much valuable information was obtained on this point which should serve as a guide for any future work on the selection of seed and the control of the supply for Behar. Mr. Leake also carried out an investigation on the localization of the indigo-yielding substance in the plant which, though at present mainly of academic interest, may prove of the utmost value in conducting researches into the physiology of indigo-yielding plants which must be carried out before the full story of the production of indigo can be told.

Finally, in summing up the history of the past researches on indigo, mention must be made of the work of Professor Popplewell Bloxam carried out at Dalsing Serai during 1903-1904. The period over which Professor Bloxam's work extended was too short to permit of his arriving at any definite results. An account of it as far as he went is, however, given in his report to the Government of Bengal, dated 1905. In the course of this report several manurial experiments are described, their chief feature being the supply of various carbonaceous materials to indigo soils with the idea of promoting the growth of the nodule bacteria. The value of the methods proposed remains to be seen; but from the facts that the manures were applied at an unsuitable season of the year, and that the results obtained are quite anomalous, no conclusion can be drawn from the experiments described. In the chemical part of the report bearing on indigo manufacture, the methods in vogue of analysing indigo are severely criticised and several statements made which are open to criticism and which further experience would probably have led the writer to modify. Mr. Leake's work on the germination of Java indigo seed and on the seed-supply of Behar, referred to above, are also embodied in Professor Bloxam's report, as well as two interesting papers by the same author (Mr. H. M. Leake) on "the soil in its relation to moisture" and "an investigation of soil temperatures."

The present work at Sirsiah can hardly yet be said to have made a beginning. The buildings, &c., have been under construction there since November last, and a crop of indigo has been grown on the lands leased. The laboratories at Dalsing Serai were dismantled in May last, and the removal of their contents to Sirsiah and the re-fitting there has occupied much time. From August 1904 until May of this year the present writer worked in the

laboratory at Dalsing Serai, and the line of investigation which was being followed, as well as the future work to be undertaken, was described in a preliminary report to the Behar Indigo Planters' Association in January last. On the manufacturing side it is pointed out that, contrary to Mr. Rawson's opinion, there may still be scope for improvement since the efficiency of the ordinary process as determined by him was founded on a method of analysis of leaf which has since been proved erroneous. If this is so, the fault must lie in the steeping process, since there is no doubt that, granted the precautions suggested by Mr. Rawson are taken, the oxidising process is as perfect as possible. The writer's researches into the *modus operandi* of the steeping process were begun at Peeprah in 1902 and continued at Mosheri in 1903, and the results of this work were embodied in a paper communicated to the Chemical Society of London in June 1904 (*vide* Journal of the Chemical Society, 1904, Vol. 85, p. 870). As a result of these researches it was concluded that the only possibility of improvement in the process lay in the direction of employing water at an elevated temperature. This has been frequently tried, and most recently by Mr. Rawson. He came to the conclusion that the hot water system offered "no advantage over the ordinary steeping process when the latter is carried out under the most favourable conditions; but in wet weather the process would repay the cost of steam." Mr. Rawson's experiments were, however, conducted at one fixed temparature and for one fixed period of steeping. A preliminary series of laboratory experiments has shown that the exact temperature of the water employed and the exact period of steeping have a very profound effect on the result obtained, and it seemed worth while conducting a series of experiments on a manufacturing scale with the object of determining the optimum combination of time of steeping and temperature of water for the steeping process. This will necessitate at least one whole *mahai* being devoted to this end, and it will form the main object of the experiments carried out both at Sirsia and at Pusa this year. It may prove that no improvement of economic value can be made in this way, but this can only be determined by manufacturing experiments. An endeavour will also be made at Sirsiah this year to conduct some trials on new modes of drying and packing indigo, and perhaps also on refining. There seems scope for improvement in all these directions. Laboratory work will, of course, accompany all these experiments, and certain researches with a more or less direct bearing on indigo problems, both agricultural and manufacturing, will be undertaken. An investigation is at present in progress having for its object a critical examination of all the established methods of indigo analysis. It is hoped that the points raised by Professor Bloxam may be cleared up once and for all thereby.

On the agricultural side little has yet been done at Sirsiah. It is proposed to carry out experiments on the selection and hybridisation of varieties of indigo, but it is doubtful whether much can be done at this until a trained botanist is made a member of the staff. As has been frequently pointed out this is a most important aspect of the work, and perhaps the direction in which the chief hope of permanent assistance to the industry lies. Certain experiments in growing selected seed were started at Sirsiah, but were unfortunately destroyed by caterpillars. It is proposed to sow an area of Java plant in October, and experiments both in methods of cultivating it for manufacture and for seed production will be started. Manurial experiments will also be undertaken on a somewhat new plan with the idea of endeavouring to remove the anomalies in the experiments hitherto conducted, and determining definitely if there is any substance that can be profitably employed to increase the production of indigo from a unit area of land. Certain agricultural experiments have also been started and are in progress at Pusa.

Another piece of work of an agricultural nature which is being undertaken at Sirsiah is an endeavour to prepare cultures of the nodule bacteria peculiar to indigo on the lines which have recently been advocated by Dr. Moore, of the United States Department of Agriculture, with a view to carrying out inoculation experiments on indigo lands.

Lastly, mention must be made of a seed farm which is being conducted by the Behar Indigo Planters' Association under their grant from Government at Dasna, near Delhi. The farm is supervised by Mr. Flavell, the Manager of the Zamindari in which it is situated. The object with which the farm was started was the production of Java seed for use in Behar. It has, however, proved that no advantage whatever arises from growing the seed in the north-west districts, and in the writer's opinion the cultivation of seed there should be discontinued and seed farms started in Behar. The cultivation of a limited amount of the seed of the Sumatrana variety might, however, be conducted in the north-west with advantage, since it will probably be always necessary to grow a certain amount of the plant in Behar and, by having their own farm, planters will be able to control the selection of the seed and be insured of a pure supply. The advantage arising out of such a system of seed production has been apparent at Sirsiah this year, when land sown with seed carefully grown and harvested at Dasna has given far better crops than similar land sown with the seed bought in open market. Experiments in methods of cultivation of indigo seed started at Dasna this year were unfortunately rendered useless by becoming overgrown with weeds, delay in the receipt of money from Government having rendered weeding impossible until too late There will be a good supply of Java seed forthcoming from Dasna this year, however, if all goes well. Some experiments in seed cultivation are in progress at Pusa, and others will be carried out at Sirsiah this year.

SIRSIAH,
The 14th August 1905.

C. BERGTHEIL,
Agricultural Bacteriologist to Govt. of India.

B. S. Press—18321—600—14-10-1905—J. S.

JUTE EXPERIMENTS IN BENGAL.

THE production of jute in Bengal has, ever since exportation of the fibre commenced in 1828, expanded so rapidly and apparently with so little effort, that until quite recently little or no serious attention has been paid to its scientific development. During the last few years, however, Jute merchants have come to the conclusion that the quality of the fibre which is being produced is deteriorating, and in 1901 a request was made to the Bengal Agricultural Department to make the matter a subject for investigation. This has been done by carrying out Agricultural Experiments at Burdwan and elsewhere under the guidance of the Inspector-General of Agriculture. The objects of these experiments may be summarized as follows:—

(*a*) to compare the respective fibres produced from different varieties of jute, both as regards weight of outturn and quality of fibre,
(*b*) to determine the stage of growth at which it is best to cut the plant,
(*c*) improvement of varieties by selection,
(*d*) manuring experiments,
(*e*) relative merits of thick and thin sowing,
(*f*) retting.

As yet no very definite conclusions have been come to as to which variety or varieties are the best, and when this has been established for Burdwan it will have to be proved to hold equally well for other districts, before distributing the seed indiscriminately.

As regards the stage of growth at which the plant should be cut:—There seems little doubt that if cut when dead ripe, the yield of fibre is rather greater than if cut earlier; but it also seems equally certain that the quality of the fibre from the late cut plant is not so good as that obtained from the plant cut at an earlier stage. These experiments are being continued, and it is hoped that it may be possible, in future, to supplement the results by subjecting the samples of fibre produced to chemical and other tests in the laboratory.

The manuring experiments tend to show the superiority of cowdung and castor cake over other fertilizers. Cowdung is the best and cheapest manure when it can be obtained, but castor cake and even a mixture of bone meal and saltpetre appear to justify their application by yielding an increased net profit. These experiments will doubtless be continued, as the results, if borne out by others, are important. There is much land in the jute districts, especially in places which receive no annual deposit of silt, which respond readily to manure, as one can see at a glance by comparing the crops near the homestead with those a little distance away. The advantage is very much with the former, doubtless on account of the extra manure they receive. If this state of things is to be changed, the raiyat will have to be taught to supplement his scanty supply of cowdung, with manures like castor and other cakes which often give results out of all proportion to their present cost.

As regards the improvement of varieties by selection the Bengal Agricultural Department has this year taken over plots of land in Faridpur, Mymensingh and Rangpore on which typical varieties of jute, local and otherwise, are being cultivated for seed alone. It is hoped that by encouraging a vigorous growth of the plants, by allowing them plenty of room, and by sacrificing the fibre for the sake of the seed, an improved strain of plant will be the result. If this scheme proves successful on the small scale, the plots are about 20 acres in extent, it is proposed to start a system of distribution of seed, obtained in this way, on a large scale.

Retting.—Under this heading may be included all the operations which the plant undergoes during the separation of the fibre from the rest of the plant.

After the plants have been cut, they are tied up into bundles and immersed in water where they are allowed to remain until the fibre comes away quite easily from the woody portion of the stem. This is brought about by a fermentation during which the tissue in which the fibres are imbedded is softened or dissolved. It is, apparently, the result of the work of a particular bacterial organism, and sterilized stems of jute inoculated with what are believed to be pure cultures of this organism ret rapidly. A most interesting observation has been made, viz., that if small amounts of Ammonia salts and salts of Phosphoric Acid be added to the water in which the retting takes place, the fermentation proceeds far more rapidly than in pure water. This may prove to be of value commercially. There can be little doubt that a prolonged immersion in water weakens the jute fibre. If therefore the time of retting could be materially shortened, a superior fibre would presumably be the result. It is impossible, however, to say anything definite until experiments have been conducted on a larger scale than is possible in the laboratory.

In the course of the investigation into the retting of jute, it was discovered that various moulds, when allowed to grow upon the stems, kept in a moist condition, have the power of dissolving or softening the tissue in which the fibres are imbedded; in other words, of performing the retting process. This is no doubt the rationale of "dew retting" of flax in Europe; but with regard to jute, it is of Scientific, rather than Economic, interest.

It is most essential for the production of fibre of good colour that the retting water be clean, *i.e.*, free not only from much suspended earth; but free as possible also from traces of iron in solution. If the water is muddy, the fibre loses its lustre and becomes greyish in colour, and experiments have proved that a brown fibre results from retting in water containing iron. Unfortunately the raiyat cannot always choose his water for retting. A good crop of jute, when green, weighs between 300 and 400 maunds per acre, and it would not pay him to cart such a weight far, even if suitable water were available at a distance. It ought always to be possible, however, to wash the separated fibre in clean water.

Deterioration—The possible causes of the deterioration which, it is generally admitted, has taken place of late years in the quality of jute fibre may be enumerated thus:—

(1) The plants grown for the sake of the fibre have actually degenerated.
(2) Lands not suited to the growth of jute have been planted with it; thus producing inferior fibre.
(3) Kinds of jute are cultivated which are unsuitable for the particular locality in which they are grown.
(4) Lands growing jute are becoming exhausted owing to insufficient of manuring and lack of application of the principle of rotation of crops.
(5) Retting is not now performed with the same care as formerly.
(6) The deterioration is due to the practice of fraudulent watering of the fibre to increase its weight before bringing it into the market.

(1) The Sub-Committee of the Board of Scientific Advice pronounce unhesitatingly against the idea of degeneration in the jute plants. They say: "The best kinds now as then, if cultivated, liberally yield excellent crops and their fibre, if properly extracted, is also excellent."

The second, third and fourth causes undoubtedly account for the appearance in the market of fibre of inferior length and fineness.

The experiments at Burdwan, Faridpur, Mymensingh and Rangpur mentioned above deal with these questions and are to be looked to for a remedy.

(5) Carelessness in separating and washing the fibre after retting is complete is the cause of sticky, dirty fibre. In isolated cases, the raiyat having more than he can do properly may not clean his fibre properly; but this is by no means generally the case.

(6) One of the principal causes of the deterioration of jute fibre is undoubtedly the practice of adding water and sometimes sand to the fibre to increase its weight before bringing it into the market.

The practice of fraudulent watering only commenced a comparatively short time ago; but it is now almost universal. Accurate estimations have been made of the amount of water, in a number of samples of watered jute. The percentages of water, calculated on the wet sample,* varied from 21 per-cent to over 55 percent. On the other hand, estimations have been made of the amount of moisture taken up by jute fibre from a saturated atmosphere at about the temperature of the rainy season. The results which are fairly consistent place the maximum of hygroscopic moisture below 20 per cent. under the most favourable conditions.

* The sample was dried at 100°c.

The balers have to dry the wet jute in the sun before baling it, for jute is a fibre which is exceedingly sensitive to the action of water, and if it is baled or even rolled into "drums" in the wet condition, it soon begins to heat, after which rotting of the fibre takes place in an astonishingly short time.

There is a very strong probability that of recent years a good deal of fibre which has been wetted has been baled for export before being properly dried. There is little doubt that such fibre would be quite rotten and therefore useless from a spinning point of view when it reaches its destination. It is easy to see from this how impressions have got abroad concerning the deterioration of the jute plant, where as all the deterioration has really taken place after the fibre has left the hands of the cultivators.

Extension of the area under jute cultivation.—According to the annual returns, the area under jute cultivation and the weight of fibre produced are continually expanding. Nevertheless, the demand continues equal to the supply.

In view of the fact that more and more persistent efforts are being made to grow jute in other countries, *e.g.*, in Java, French Indo-China, and West Africa where £ 3,000 is said to have been spent last year on experiments, it is advisable to consider whether the area of cultivation cannot be extended from Bengal to Madras, Bombay and Burma in each of which provinces it has been suggested there are tracts suitable for the purpose.

Robert S Finlow
Jute Expert.

Pusa
The 12th September 1905.

B. S. Press—18295—630—16.10.1905—C. A. P. & J. T. C.

REVENUE DEPARTMENT.

AGRICULTURE.

DARJEELING, THE 5TH OCTOBER 1905.

RESOLUTION—No. 3909T.—R.

READ—

The Report of the Agricultural Branch of the Department of Land Records and Agriculture, Bengal, for the year ending 31st March 1905.

Read again—

Resolution on the same report for the year ending 31st March 1904.

The Department was in charge of Mr. S. L. Maddox from the beginning of the year to the 28th March 1905, when he made over charge to Mr. N. D. Beatson Bell. Altogether 156 days were spent by Mr. Maddox on tour in connection with agricultural work and sericultural operations. During the year under report the Department has been strengthened by the appointment of a Deputy Director of Agriculture. Both the Director and Deputy Director and his two Assistants attended a meeting of the Board of Agriculture at Pusa in January, to which all Provincial Directors, officers of the Veterinary Department and other scientific officers from the various Imperial and Provincial staffs in India were invited. Their recommendations and suggestions are now being considered and carried out by the Director and his staff.

2. *Agricultural Improvements.*—The Lieutenant-Governor gratefully acknowledges the special grant of Rs. 12,000 allotted by the Government of India for agricultural improvements, and is glad to find that it has been applied to really practical objects, viz., the provision of nurseries for rearing silkworm seed under scientific and hygienic principles and the free distribution of a manure which for several years in the Burdwan farm has produced exceptional results on the outturn of paddy.

3. *Reorganization of the Agricultural Department.*—Towards the end of the year under report, the Government of India announced that a large permanent grant would be given to every Province in India for the development of its Agricultural Department. Proposals were accordingly submitted by this Government, and recently a permanent grant of Rs. 3,50,000 per annum has been allotted to this Province by the Government of India, on the understanding that a proportionate reduction will be made in the event of the transfer of a certain portion of this Province to Assam. The Lieutenant-Governor now desires to make public the following scheme for the development of the Agricultural Department in this Province which has been provisionally accepted by the Government of India. It is proposed to create a separate Director of Agriculture and to give him a complete staff of peripatetic experts. A Provincial Agricultural College will also be established under the supervision of European and Indian professors. Besides providing agricultural education for the sons of limited number of landholders, this College will provide trained men to supply the staff of all the other agricultural institutions in the Province, and to fill the graded Agricultural Service which the Lieutenant-Governor hopes to form as soon as possible. As trained men are turned out from the Agricultural College, large farms will be opened at selected centres at which agricultural experiments will be undertaken with a special view to the agricultural wants of the tracts within which the experimental farm is situated. A portion of the area will be set aside for seed selection, and it is hoped in course of time to place depôts for seeds, implements and manures at each experimental farm, and to supply them at the lowest possible prices to the public. When an experimental farm is established, agricultural improvements suited to the tracts of which it forms the centre

will be brought home to the cultivators by means of demonstration farms. These farms will be smaller and more numerous than the experimental farms. They will be temporary in nature, and will be opened at such places and for such periods as occasion requires. Apart from this general scheme, it is proposed to retain a few special experts for certain important crops. The Lieutenant-Governor proposes to continue to give assistance to agricultural fairs and to other of means disseminating agricultural knowledge among the people. In particular the several Agricultural Associations will be fostered and afforded financial support and expert advice when necessary.

4. *Scientific Enquiries.*—His Honour is glad to notice that the Department has during the past two years co-operated with the Board of Scientific Advice in regard to the alleged deterioration of jute, and to observe that the conclusions at which the Board have arrived, viz., that there is not only no proof that any degeneration in either of the two species of jute plants has occurred, but there is strong evidence that the plants are now precisely as they were a century or more ago, will go far to allay the gloomy forebodings in consequence of which these enquiries were instituted. The suggested legislation to penalize the fraudulent watering of jute is still under discussion. An attempt was made during the year under report to introduce superior varieties of Egyptian and American cotton, and the best varieties from other Provinces of India. The Lieutenant-Governor regrets that, owing to heavy and continuous rain and the unusal severity of the winter, the trial was a failure. Scientific enquiry regarding the cultivation of cotton in Bengal is entirely at the experimental stage, and His Honour thinks that several years of investigation and seed selection must necessarily pass before the Department will be in a position to confidently recommend selected varieties to the raiyat, or to undertake seed distribution on a commercial scale to the public.

5. *Irrigation Experiments* were undertaken on the lines indicated by the Irrigation Commission, especially with regard to economy in the use of water. It appears that it is too early to summarise the results, and the experiments are being repeated at all the places at which they were tried last year. The Lieutenant-Governor hopes that crop-cutting experiments on fairly comparable irrigated and unirrigated areas will be conducted on a much larger scale during the coming season, and that the co-operation of officers of the Irrigation and Agricultural Departments in the conduct of these experiments will establish the value of irrigation, and trusts that the results will be published in the vernacular and widely distributed.

6. *Experimental Farms.*—Besides the three farms, Sibpur, Chittagong and Cuttack, mentioned in the Report for 1903-1904, arrangements were made during the year under report for establishing two more farms (one at Rampur Boalia and the other at Rangpur). A consideration of the reports of the work done in each farm shows that the manuring of paddy with saltpetre and bone-meal did not produce results in the Sibpur and Cuttack farms equal to those in the Burdwan farm. The question of cattle breeding, which only arises in the Sripur farm, has been separately dealt with in the recent Resolution on the Report of the Veterinary Department. This Government has decided to support the policy, laid down by the Inspector-General of the Veterinary Department to the Government of India, of improving local breeds for agricultural purposes by a process of rigorous selection, and of discountenancing cross-breeding, except for improvement in milking qualities.

7. *The Experiments in Government and Wards' Estates* still show want of continuity and of definite aim. His Honour hopes that in the course of the development of the Agricultural Department trained officers will be supplied to immediately supervise the various experiments in these estates, and that programmes will be framed for them by the more highly trained officers of the Agricultural Department. An attempt should be made also to attract raiyats from Government and Wards' Estates to the Government farms, and to provide for them suitable instruction in methods of cultivation.

8. The Lieutenant-Governor desires to call the attention of District Officers to the circulars issued by the Entomologist to the Government of India, and trusts that his instructions will be complied with and every facility given to him or his assistants to investigate all cases of damage by insect pests.

9. *Sericulture.*—The Lieutenant-Governor is glad to find that the Silk Committee continues its useful work in the districts of Birbhum, Malda, Murshidabad and Rajshahi, and trusts that with larger funds at its disposal its sphere of usefulness may be widely increased. In the district of Malda a sericultural class in connection with the Jote Arapur Middle English School has been opened.

10. *Agricultural Education.*—Ten students passed out of 14 at the final examination from Sibpur. The Lieutenant-Governor hopes to employ as many of these passed students and of the passed students of the previous years as possible in connection with the scheme for development of the Agricultural Department, and to include them in the proposed graded services. Four passed students selected by the Director of Land Records have lately been sent to America for a post-graduate course of two years' practical training, and one passed student was deputed to Pusa for a course of training in Entomology and another to Burma for training in cigar-making.

Agricultural classes have been attached to the Ravenshaw College and Collegiate School at Cuttack, the Chittagong Collegiate School, the Gaya Zilla School, the Dumraon High School, Howrah Zilla School and the Burdwan Municipal School. His Honour trusts that every effort will be made to supplement the lectures by as much practical and manual training as possible. He hopes that District Boards will, in time, provide scholarships for selected students from these classes to proceed to the proposed Bengal Provincial College of Agriculture.

The Rajshahi Sericultural School during the year under report has enlarged its courses of study, and now teaches not only sericulture but also weaving and other technical subjects, such as Engineering, Carpentry, etc. It is hoped that the District Board of Midnapore, in view of the falling-off in the number of scholars of the Sabong Seri-Agricultural School, may be able to afford more assistance in the way of encouraging pupils by scholarships.

11. *Publication of Agricultural information, etc.*—The Lieutenant-Governor trusts that, with the proposed increase of the expert staff of the Department, fuller publication of results in farms will be made both by distribution of pamphlets in the vernacular, by publication of an agricultural magazine, and by *communiqués* to the press.

12. *Agricultural Associations.*—With a view to securing for Government the co-operation of men interested in agriculture, His Honour the Lieutenant-Governor inaugurated in August last the Bengal Provincial Agricultural Association. The members include some 33 leading zamindars and men of business, and meet at Writers' Buildings, Calcutta. Steps are being taken to provide a large reference library for the members of the Association. A Divisional Agricultural Association was also formed at Calcutta and a District Association at Rangpur during the year under report, and more associations are now being formed.

13. *Indigo.*—With the help of the Bihar Indigo Planter's Association, experiments on the manufacture of indigo and on the cultivation of Java-Natal and Java-acclimatised seed have been made, and His Honour has recently given a prize for the invention of a cheap machine for treatment of this seed to ensure germination.

14. The thanks of the Lieutenant-Governor are due to Mr. Maddox for the zeal with which he has managed the Department during his tenure of the office of Director, to the Assistant Directors, Messrs. D. N. and N. G. Mukerji, and to Mr. Beatson Bell, for an interesting report.

15. In conclusion, His Honour desires to place on record his appreciation of the valuable advice and assistance rendered by the officers in the Imperial Agricultural Department, especially Messrs. Sly, Mollison and Lefroy, and Dr. Butler.

By order of the Lieutenant-Governor of Bengal,

R. W. CARLYLE,

Offg. Chief Secy. to the Govt. of Bengal.

No. 3911T.—R.

COPY, with a copy of the report, forwarded to the Director of Public Instruction, Bengal, for information and necessary action, with reference to paragraph 10 of the Resolution.

No. 3912T.—R.

COPY, with a copy of the report, forwarded to the Municipal Department of this Government, for information and necessary action, with reference to paragraph 10 of the Resolution.

No. 3913T.—R.

COPY, with a copy of the report, forwarded to the Appointment Department of this Government, for information, with special reference to paragraph 14 of the Resolution.

Unofficially.

COPY forwarded to the Secretary to the Board of Revenue, Land Revenue Department, for information of the Board and for communication to the Director of Land Records and Agriculture, Bengal.

By order of the Lieutenant-Governor of Bengal,

M. C. McALPIN,
Under-Secy. to the Govt. of Bengal.

DARJEELING,
The 5th October 1905.

B. S. Press—22839—624—17-10-1905—J. A. M.

REPORT

OF THE

AGRICULTURAL DEPARTMENT,

BENGAL,

For the period of 15 months, from 1st April 1905

to 30th June 1906.

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1906.

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[Maximum limit, 20 pages.]

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DEPARTMENT OF AGRICULTUTE, BENGAL.

No. 3883A.

FROM C. E. A. W. OLDHAM, ESQ., I.C.S.,

Director of Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE, L. P.

Dated Calcutta, the 12th September 1906.

SIR,

I HAVE the honour to submit the first annual report of the Agricultural Department, Bengal, as it is now constituted. The last report of this Department, then forming a branch of the Department of Land Records and Agriculture, was for the year ending the 31st March 1905. Under the orders of the Government of India in the Revenue Department, conveyed in their letter No. 6—231-1, dated the 8th March 1906, the period to be covered by the report was changed from the year ending on the 31st March to the year ending on the 30th June. The present report relates to the period of 15 months from the 1st April 1905 to the 30th June 1906.

CHAPTER I.

ADMINISTRATION.

2. *Charge.*—Mr. N. D. Beatson Bell, I.C.S., was in charge of the Department, as a branch of the Department of Land Records and Agriculture, from the 1st of April to the 16th of October 1905. Meanwhile the scheme for the organisation of a separate Department of Agriculture had been taken in hand, and I was placed on special duty in this connection. I was in charge of the work of the Department while on special duty from the 17th of October 1905 till the 3rd of April 1906, when, the separate appointment of Director of Agriculture having been created, I was appointed to be Director, and as such held charge of the Department till the 30th of June. Mr. F. Smith, B.SC., was Deputy Director of the Department throughout the year. He was in direct charge of the farms. There were three Assistant Directors in the Department, namely, Mr. N. G. Mukherji, Mr. N. N. Banerji and Mr. D. N. Mukherji. The new scheme, however, for the reorganisation of the Department did not contain provision for any Assistant Director after the 1st of April 1906. I have had, therefore, to obtain sanction to the creation of a post of Personal Assistant to the Director to deal with routine office work at head-quarters while I am on tour. This post has been held during the past year by Mr. D. N. Mukherji. Mr. N. G. Mukherji was Assistant Director from the 1st of April to the 31st of May 1905. From the 1st of June he was deputed to Kashmir and Bangalore to conduct investigations with the object of improving the method of reeling silk in Bengal. He was again on deputation from the 1st of November 1905 to the Baroda State in connection with the subject of sericulture in His Highness the Gaekwar's territories. Mr. Mukherji took three months' privilege leave with effect from the 1st of May 1906. Mr. N. N. Banerji, Assistant Director, on being relieved of his appointment as Superintendent of the Sripur Farm, Hathwa, was placed on deputation to Bihar and the eastern parts of the United Provinces, with effect from the 1st of December 1905, in connection with the subject of well irrigation. He is now

engaged in writing a report of his investigations. There were formerly four travelling overseers in the Department; two of these were transferred to Eastern Bengal and Assam on the partition of the Province.

3. *Organisation of the Department.*—A general scheme for the development of the Agricultural Department in this Province was submitted to the Government of India with Revenue Department letter No. 529T.—R., dated the 3rd of May 1905. The proposals therein made were generally approved, and my time has been largely occupied in working out the details necessary to give effect to them. The two offices with their staffs and records had first to be separated, and the establishments made distinct. It was found, when the separation took place, that the number of assistants previously employed on agricultural work in the joint office of the Director of Land Records and Agriculture was quite insufficient to cope with the rapidly increasing work of the Agricultural Department, in which development was taking place along so many lines at once. With my letter No. 3930A., dated the 26th of December 1905, I submitted proposals for the revision and increase of ministerial establishment. These were sanctioned in Government Order No. 1410, dated the 16th March 1906. With my note, dated the 15th of December 1905, I submitted proposals for the creation of a separate agricultural service: these are still under the consideration of Government. With my note, dated the 21st February 1906, I submitted to the Board of Revenue a scheme for ten years for the development of both the Agricultural and Veterinary Departments. The establishment of a Seed and Implement Store received early attention, as great difficulty was being felt in meeting the numerous applications for seeds and implements being received, in consequence of the intention of Government to supply seeds and manures on an extended scale becoming generally known. The original proposal was that a store-room should be provided by Government. The difficulty of procuring a site and the delay that would be involved in erecting a new building of the size required necessitated the temporary hiring of accommodation. The Deputy Director, Mr. F. Smith, discovered a very suitable godown within six or seven minutes' walk of the office. Arrangements were made for the hiring thereof. A start was at once made to collect a stock of seeds and implements. Necessary registers and forms were drawn up by me, and a Superintendent of the Store appointed. As requests are almost always received from the Managing Committees of fairs and agricultural and industrial shows for new and improved agricultural implements for exhibition and demonstration, steps have been taken to form two separate collections of implements, manures and seeds which can be sent round in charge of competent officers.

4. One of the most important matters pending when I assumed charge of the Department was the selection of a site for the proposed Provincial Agricultural College and the Experiment Station to be attached thereto. After visiting many districts in this connection, three sites were picked out from which to choose one. The Inspector-General of Agriculture, Mr. Sly, and Dr. J. W. Leather, Agricultural Chemist to the Government of India, kindly visited these localities with me; and as a result a site at Sabaur, near Bhagalpur, was ultimately chosen and accepted by Government. Steps were taken for the acquisition of the area required, and possession has now been obtained from the revenue authorities of great part of the land. 342 acres in all are under acquisition. The necessary plans for the several buildings *i.e.*, College, Hostel, Professors' and Assistant Professors' quarters, and clerks' and menials' quarters, were drawn up by me in consultation with expert advisers, and rough plans and estimates have been submitted to Government.

5. A site for a new Experiment Station for South Bihar was also selected near Bankipur, and steps taken for the acquisition of the land. Some 306 acres have been acquired at this site. Schemes for the laying out and stocking of these two Experiment Stations have been prepared, and steps are now being taken to give effect to them. I also selected a site near Ranchi for an experiment station for the upland tracts of Chota Nagpur, but it has not been finally accepted yet. The question is not very urgent, as funds will not permit of this station being taken in hand for another year or two. Under the orders of Government, a Tasar Silk Farm has been opened towards the end of the year at Chaibassa, in the Singhbhum district, and work has already been started there under the supervision of Mr. N. G. Mukherji. The necessary buildings

for the Superintendent, labourers and cattle are now being erected. Cattle have been purchased, and the land prepared and sown with crops this year, so as to utilise it, pending the growth of the *asan* trees that are being planted.

6. The preparation of the Weather and Crop Reports and Crop Statistics was made over to this Department during the year, and later on orders were received transferring the preparation of all rainfall statistics to this Department from the office of the Meteorological Reporter to Government.

7. *Tours.*—Mr. N. D. Beatson Bell was on tour in connection with the Agricultural Department for 30 days. He inspected the farms at Rangpur and Gouripur, and attended the cattle fair at Kalam, Rajshahi district, before the division of the Province. He also inspected the farm at Cuttack, and visited the Sirsia Research Station. I was on tour for 92 days. I inspected all the farms, and attended the exhibitions and fairs at Sonepur, Barahpur, Sripur and Bankura. I inspected many veterinary dispensaries. I also paid a visit to the Sirsia Research Station. I visited the districts of Murshidabad, Birbhum, Bhagalpur, Sonthal Parganas, Monghyr, Patna, Gaya, Burdwan, Bankura and Midnapur in connection with the selection of a site for the Provincial Agricultural College. I attended the second annual meeting of the Board of Agriculture in India at Pusa for seven days, commencing on the 15th January 1906. I attended meetings of the Orissa, Chota Nagpur and Patna Divisional Associations, besides meetings of several District Associations, with the object of making the personal acquaintance of the members; and I paid three visits to Berhampore, and attended a special meeting of the Bengal Silk Committee, in connection with the decline of the silk industry. Besides the ordinary duties pertaining to the Director, I was assigned the duty of visiting all industrial and technical schools. Many districts were visited in this connection.

8. Mr. Smith, the Deputy Director, constantly visited all the farms under his charge, besides the four special jute farms established by the Provincial Agricultural Association. He also visited the fairs at Sonepur, Suri and Kalimpong, and inspected many sites proposed for farms, schools, gardens, etc. Mr. D. N. Mukherji attended the exhibitions at Sonepore, Midnapore, Bankura and Tintanga. Mr. N. G. Mukherji was present at Khulna while the annual show was going on there, and a Travelling Inspector attended three shows.

9. *Miscellaneous Work.*—The preparation of a Manual of Arboriculture has been taken up by me under the orders of Government. This work is now approaching completion. The preparation of a scheme for the training of District Board Overseers and Sub-Overseers in Arboriculture was also taken up, and proposals in this connection have been submitted with my letter No. 2818A., dated the 17th July. Under instructions from the Board of Revenue, suggestions have also been submitted for providing an expert staff which would gradually draw up reports and maps showing the need of and facilities for additional small works of irrigation, and who would be prepared to give free advice, to supply designs for embankments, sluices and escapes, to make trial borings and bore through strata impervious to the tools of the ordinary cultivator, and generally to aid the small proprietor or tenant to make the best use of his opportunities for improving the irrigation of his fields. Some correspondence has also taken place with the Director of Public Instruction in regard to agricultural teaching in schools and the provision of gardens in connection with training schools. Certain sites for such gardens have been inspected by me and by the Deputy Director.

10. In May last the principal firms interested in the silk industry submitted a strong representation to Government drawing attention to the marked decline in the industry in this Province, and asking that prompt measures might be taken to re-establish it. In consequence, a small Committee was appointed by Government to institute enquiry into the present state of the silk industry and the causes of the alleged decline, and to suggest remedial measures. I was appointed to be Chairman of this Committee, which has completed its work since the close of the period now under report.

11. Under the instructions of the Inspector-General of Agriculture, the work of compiling a rough classification and account of the soils of the Province has been taken in hand, and preliminary sketch maps have been obtained from the District Officers.

12. The preparation of a list of the principal economic plants grown in the Province giving the botanical and English names, and the Bengali, Hindi and Uriya vernacular equivalents, has been almost completed. This list, it is hoped, will be of use to local officers and members of agricultural associations.

13. The second annual meeting of the Board of Agriculture in India was held at Pusa on the 15th January 1906 and succeeding days. Captain Trydell, Officiating Superintendent, Civil Veterinary Department, Mr. F. Smith, Deputy Director of Agriculture, and I attended the meeting as members from Bengal. The recommendations and suggestions of the Board are being given effect to as far as possible in this Province.

14. The Government of Bengal continued its grant of Rs. 50,000 a year for the feed and keep of a herd of cattle at Pusa. No cross-breeding is allowed. It is hoped that the herd will soon be able to supply suitable bulls for improving the breed of cattle in this Province. The grant is a large one, and some tangible result from the breeding operations may reasonably be expected.

CHAPTER II.

Special Enquiry and Experiment.

15. *Collection of articles for the Indian Museum and the Imperial Institute, London.*—During the year, botanical specimens of bark, gum, oil and seeds of a large number of plants were collected by this Department through its Travelling Inspectors for the Imperial Institute, London, and the Indian Museum.

16. *Cultivation of Jute.*—As in previous years, various experiments were carried out with jute on the Burdwan farm on the lines indicated by Mr. Mollison, Inspector-General of Agriculture in India. Samples of the fibre were sent to the Calcutta Baled Jute Association for appraisement. The result of the valuation showed that out of the 47 varieties of *capsularis* experimented with, *Amonia* of Pangoa, *Dhalsandar* of Narsingdi-Dacca, *Heuti* of Rangpur and the plants grown from the seed preserved at the farm from the previous year's crop stood first; *Phulesvari* of Tippera stood second; and *Deswal* and *Barapat* of Sirajganj-Pabna, *Heuti*, white and red, of Rangpur, *Baran* of Narainganj, and *Heuti* of Jalpaiguri, third in price. The *Heuti*, white, of Rangpur, was described as brittle. Out of 10 *olitorius* varieties, the *Tosha* of Sirajganj, *Satnala* of Rajbari-Faridpur, *Paknalya* and *Halbilati* of Pabna were valued the highest; and *Desi-lalpat* from Serampur, *Bangi* and *Deonalya* stood next. The difference in price, however, was nominal.

17. In the experiment on the cutting of jute plants at different stages, it was found that the fibre from plants cut in flower gave the heavier body of best value, being priced at Rs. 10-8 per maund. Next came fibre obtained from the plants that were cut in bud and from those that were cut when fruits had set. But the fibre from the plants cut before budding had the best colour, though they were priced the lowest, *i.e.*, at Rs. 10 per maund. In the manurial experiments the fibre obtained from plots manured with cowdung gave the best result, though the colour of the fibre was reported poor. As a result of the drilling *versus* broadcasting and the spacing experiments, no difference was observed in the fibre by the experts. In the case of the thick and thin sowing experiment, the samples obtained from the thick sown plot gave the better fibre.

18. In order to obtain improved seed, a system of seed selection was carried out in 1905 at four centres, viz., Rajbari (Faridpur), Gouripur (Mymensingh), Rangpur and Jalpaiguri. A short note by the Deputy Director on the work done will be found in Appendix I. The seed obtained was stored by the Department and distributed during the year under report to the special jute farms and experiment stations and to certain private persons who applied for seed.

19. During the year steps were taken to establish four special jute farms on a much larger scale at suitable sites in important jute districts, viz., at Purnea, Berhampur, Krishnagar and Chinsura. At Purnea 30 acres were leased, at Krishnagar 28 acres, and at Chinsura 18½ acres; while at Berhampur 23 acres were generously placed at my disposal for the purpose by the Maharaja of Kasimbazar. Selected seed, as stated above, was distributed to each of these farms, and a passed student of the Sibpur agricultural classes placed in charge of each. Labour and bullocks, ploughs and other implements have been hired, and

manure purchased locally. The Deputy Director has devoted much attention to these farms, the results obtained from which will be published in due course. The great difficulty felt in maintaining such farms as these is that constant inspection is required to ensure that instructions are carried out, and the superior staff is not yet sufficient for this.

20. The proposals of the Bengal Chamber of Commerce for legislation to penalise the adulteration of jute are now under the consideration of Government.

21. *Cotton Cultivation.*—Seeds of the following varieties were obtained from the Inspector-General of Agriculture, and distributed by this Department during the year:—

Dharwar American (acclimatized)
Allen's Hybrid (American)
Egyptian (Yannovitch) ...
Broach ... ...
Jari ... ...
Bani ... ...

In addition to the foregoing, some Buri kapas seed of Singhbhum was also distributed. This last is probably of American origin like the Dharwar, but nothing is known as to how and when it was introduced into Singhbhum and the adjoining districts. The distribution took place before the partition of the Province, and included several districts that now form part of Eastern Bengal and Assam. Reports have been received from 32 persons in all. The season was very wet, even for Bengal, and therefore peculiarly unfavourable for this crop. The result, as disclosed from the reports received, was general failure, except in the case of Dharwar American and Buri kapas, which did well in places. The Egyptian variety proved, if anything, worse than any of the others: and this was perhaps to be expected in the climate of Bengal. It germinated badly, and in many places suffered severely from insect pests. The Broach and the Bani varieties also were largely attacked, but where any local varieties were grown side by side the latter are reported to have escaped the ravages of the insects. It is unnecessary to go into the details of the trials; but a few of the more interesting cases may be cited. In Dhenkanal (Orissa Tributary State) the Dharwar variety gave an outturn of 7 maunds 32 seers per acre of seed cotton. In the Cuttack district, Babu Jagat Ballav Ghosh obtained 6 maunds 10 seers of seed cotton per acre from Buri kapas seed. He reports it to be superior to the local cotton (Haldia). At the Cuttack experiment station, Dharwar gave an outturn of 580 lbs. seed cotton, against only 30 lbs. from Broach. The local Haldia variety gave 582 lbs., or almost the same as Dharwar; while Jari and Bani gave only 66 lbs. and 24 lbs., respectively. In Monghyr district Chowdhuri Aziz-ul-Hakk found the Dharwar far superior to the local variety, but the Egyptian was a failure. Mr. Solano reports from Arwal, district Gaya, that all the four varieties tried by him, *viz.*, Dharwar, Egyptian, Bani and Broach, suffered severely from excessive rain, but under equal disadvantages the Dharwar gave a better outturn than the rest. The reports from the eastern districts are almost without exception a record of failure. Some Caravonica cotton seed was also received from the Inspector-General of Agriculture in India, and distributed for experimental cultivation among a few persons. The reports received up to June last show that the plants were in good condition, but had not begun to flower then. A few plants are growing at the Cuttack Experiment Station, and they appear to be doing very well at present.

22. The attempt to improve indigenous varieties of cotton by seed selection, which was undertaken in the preceding year at the instance of the Government of India, was continued. A plant to plant selection was made, and the seed collected from the best plants was re-issued to the local raiyatis, the crop grown from this selected seed undergoing a fresh selection. A continuous record is kept of the names of the raiyats, the character of the soil, the nature of the seasons, etc. The result in Bihar has been so disappointing, that I propose next year to take up this work in more promising localities, where cotton has been already cultivated with some measure of success.

23. The Buri kapas of Singhbhum is a prolific variety producing a fairly long staple cotton, of a quality that will find a ready sale in the European market. It is cultivated chiefly by the aboriginal tribes

in Singhbhum and the neighbouring districts. As the result of a large number of experiments with exotic varieties tend to show that they are not likely to succeed in this Province, with the exception of the Dharwar acclimatised American, it was decided during the year to try and encourage the cultivation of the Buri variety in those tracts which were suited to it, and where the cultivators were already accustomed to growing cotton. For facility of supervision, two centres were selected—one in Singhbhum and one in the Sonthal Parganas. A Travelling Inspector of the Department was deputed to sound the cultivators in these tracts as to whether they would undertake the cultivation of this variety of cotton if advances of seed and money were given on certain conditions. The conditions were readily accepted. Accordingly the Travelling Inspector was deputed to the cotton-growing parts to collect a supply of good seed. This was distributed during the year to 31 raiyats in one centre and to 36 raiyats in the other centre ; and the fields are being constantly visited by the Inspector. The result will be of much interest.

24. *Cultivation of wheat.*—As the experiment with Muzaffarnagar wheat was not very successful in the previous year, as reported in paragraph 10 of that year's report, owing to the unfavourable weather, it was decided to repeat the experiment this year, and accordingly 100 maunds of this variety of wheat were distributed to the districts of Burdwan, Birbhum, Bankura, Nadia, Murshidabad, Rajshahi, Dinajpur, Patna, Saran, Shahabad, Muzaffarpur, Champaran, Darbhanga, Purnea, Monghyr, Sonthal Parganas, Cuttack, Ranchi and Palamau. Saltpetre manure was also distributed to places other than in the Bihar districts. The results as reported have not been encouraging on the whole. The unfavourable weather of the year, *i.e.*, want of rain at the sowing season in October and heavy and continuous rain accompanied by cloudy weather, and in places by hailstorms, in January and February, was mainly responsible for this. More or less satisfactory results were obtained only in the districts of Shahabad, Purnea, Monghyr and Dinajpur.

25. The Subdivisional Officer of Buxar distributed the seed to several raiyats in that subdivision, and 5 seers of seed produced from 1 maund 10 seers to 3 maunds of wheat. These were good results. The proprietor of the Deo Kumar Estate, Arrah, reported that 1 bigha of land sown with Muzaffarnagar wheat yielded 5 maunds 30 seers, while the same area sown with local wheat yielded $4\frac{1}{2}$ mauuds. Babu Hari Har Prosad Singh of Dumraon reports that the cultivation of Muzaffarnagar wheat was a success and gives good promise, as the cultivators in his estate had shown much eagerness to take it up on a large scale if they could get a supply of good seed in time. He is being encouraged to make the necessary arrangements for this.

26. In Saran the results were inconclusive. In Monghyr 10 seers of wheat were sown on 5 cottahs of land of a raiyat of Babu Baijnath Goenka in village Dagra. The yield was 2 maunds 35 seers, which was a fairly good return. In the district of Dinajpur the seed did well in one estate. In Bankura the outturn was below the average, owing, it is said, to late sowing and the bad weather from January to March. In Patna, hail damaged the crop, but Babu Kedar Nath Banerji of Bankipur obtained from the Muzaffarnagar seed a 25 per cent. increase over the ordinary yield of the local variety. In Muzaffarpur, Choudhuri Raghunandan Prosad Sinha, Zamindar of Mahamadpur, sowed Muzaffarnagar wheat and local wheat side by side. At first the seedlings of the former looked healthier than, and superior to, those of the latter, but the local wheat did better in the end. He attributes this to the effect of the hot westerly winds. In Champaran the Muzaffarnagar seed was tried at several Indigo factories. The Manager of Lalsaraya reported that, like all the white wheat grown on about 150 acres of land, it was badly attacked by rust, and gave a very poor outturn, while the local wheat was almost free from this disease. Mr. A. Keogh of Sujapur, Murshidabad, reported that the seed supplied by this department was sown at the end of October on specially selected alluvial deposit lands on the Bhagirathi *chars*, and germinated well. The crop made fairly good progress till about the end of January, when heavy rain set in and continued practically all through February. This excessive moisture brought on rust, and the crop was completely ruined.

27. *Cultivation of Central Provinces fine Aus Paddy.*—In the beginning of 1905 it was decided to try and introduce the Central Provinces variety of fine

aus paddy. Owing to the fact that one consignment of seed was lost in transit, it was not till the end of May that 30 maunds of the seed could be procured. This quantity was immediately distributed in the districts of Jessore, Nadia, Murshidabad, Rangpur, the 24-Parganas, Cuttack and Ranchi. It was late, however, then to sow *aus* paddy in Bengal proper, and the experiments in the Bengal districts practically failed in all cases. The results however obtained in some cases in the district of Ranchi indicated that this variety of paddy could be successfully grown on the uplands of Chota Nagpur, where conditions must be somewhat similar to those in the Central Provinces. During a visit I paid to Ranchi in February last, several gentlemen spoke hopefully of the cultivation of this rice. Advantage was accordingly taken of a small grant of money from the Inspector-General of Agriculture to apply to the Central Provinces for 100 maunds of seed. Unfortunately, however, only 15 or 16 maunds could be sent. This quantity was distributed in the districts of the Chota Nagpur Division and a Travelling Inspector has been assigned the duty of watching the results locally. Arrangements have been made to obtain a larger supply of Central Provinces fine *aus* seed in the Sambalpur district, from the present season's crop, to be stored for systematic distribution next year.

28. *Irrigation Experiments.*—The experiments referred to in the previous year were continued in 1905 on a small scale at Burdwan, Dumraon and Ramnagar, in the Shahabad district; but the results obtained were not conclusive nor regarded as thoroughly reliable. It has been decided during the current year, in consultation with the Chief Engineer, Irrigation Branch, to abandon the experiments until it is possible to carry them out on a larger scale at more suitable sites, and where an officer of some standing can supervise the work. It is useless carrying on an experiment of this nature, unless it can be done under the constant supervision of a competent and reliable officer who can be continuously present during the irrigation season, and see that the water is applied and let out strictly in accordance with the programme. An occasional visit by a Travelling Inspector or the Deputy Director of Agriculture is not sufficient, if trustworthy conclusions are to be drawn. Moreover the area under experiment must be larger than what is at present available at Burdwan and Dumraon. It is intended that these experiments will be resumed later on when the superior staff is strengthened.

29. *The use of Bonemeal and Saltpetre as Manure for Paddy.*—As stated in paragraph 3 of last year's report, bonemeal and saltpetre were purchased for free distribution out of the special grant made by the Inspector-General of Agriculture in India in the financial year 1905-06. These manures were distributed through three different agencies, viz.—(1) the Dewan of the Burdwan Raj, (2) the Overseer of the Burdwan Experiment Station, and (3) the Overseer of the Sibpur College Farm.

The manures distributed through the Overseer of the Sibpur Farm were mostly given to gentlemen more or less interested in agriculture, several of them being members of the Provincial Agricultural Association or some local Association. The reports received are mostly disappointing. But the manures distributed through the Dewan of the Burdwan Raj and the Overseer of the Burdwan Experimental Farm were given to the actual cultivators direct. The Dewan's report shows that 595 maunds of bonemeal and 139 maunds of saltpetre were distributed to 167 raiyats in four districts, *viz.*, Bankura, Burdwan, Hooghly and Birbhum. Of these 167 raiyats, 151 were Hindus and 16 Muhammadans, and among the Hindus no fewer than 22 were Brahmans. This is most encouraging, as showing that the prejudice against the use of bonemeal is gradually breaking down. The results vary a good deal in the four districts. The Birbhum figures in particular are very low, not only for bonemeal and saltpetre but for cowdung also. This was most probably due to a bad season. Fairly good results were obtained in Hooghly, but it was in Burdwan and still more in Bankura that the best effect was produced. The following table shows the average outturn per acre of unhusked paddy in the two last named districts:—

	Bankura.		Burdwan.	
	Mds.	Srs.	Mds.	Srs.
Manured with bonemeal and saltpetre ...	39	30	30	18
Unmanured	12	30	16	4

The report of the Overseer of the Burdwan Experiment Station shows that, out of 57 cases in the neighbourhood of the farm, the result was good to very good in 9 cases, satisfactory in 24 cases, indifferent in 3 cases and a failure in 21 cases, due to the unfavourable season, there being too much rain at the time of transplanting the seedlings and no rain whatever at the critical time of flowering.

The results, though not conclusive, are sufficiently satisfactory and encouraging to make it desirable to continue these experiments. The statement in Appendix II compares the results obtained in 13 cases with the results in neighbouring unmanured plots. Two hundred maunds of bonemeal and 50 maunds of saltpetre have again been sent to the Dewan this year for free distribution to the raiyats. The results already obtained have been widely published, and brought to the notice of all members of local agricultural associations. It is intended to take measures next year to distribute these manures on a larger scale under the supervision of an officer of the Department specially deputed for the purpose.

30. *Agricultural Implements.*—Trial was made of the working of the Meston plough, as compared with the local implement at two Agricultural Shows during the year, the result being in favour of the Meston plough. A few indents have been received for this plough which have been supplied from the Departmental Implement Store. A comparative test was made during the year by Mr. Foster, Collector of Birbhum, of the efficiency of a Behia sugarcane press, as compared with a press made by a Native firm in Howrah. The test appears to have been a fairly thorough one, and was in favour of the latter machine, which has now been supplied to three of the Departmental Experiment Stations, for trial. The usual list of implements tried in the Province during the year is given in Appendix III.

31. *Experiment Stations.*—In accordance with the instructions contained in paragraph 3 of the letter No. 6—231-1, dated the 8th March 1906, from the Government of India in the Department of Revenue and Agriculture, a short account of the administration of each station has been given in Appendix IV below. The annual report of each station is being separately published. Thanks to the indefatigable energy of the Deputy Director in charge of the farms, considerable progress has been made at each, and we are now in a position to make several definite recommendations as a result of the experiments carried out; but the closer supervision that has been exercised during the year has the more clearly exposed the many deficiencies of the class of overseers now in charge. It is not possible for one officer, however energetic he may be, to continually watch several stations situated in distant parts of the Province, in addition to the other duties pertaining to his office; and until the scheme for a separate Agricultural Service for the Province be passed, and a superior class of men can be placed in charge of the experiment stations, the work cannot be wholly satisfactory.

CHAPTER III.

Agricultural Experiments in Government, Wards' and Private Estates.

32. *Potatoes.*—On the whole, the year was unfavourable to this crop, as it was to the *rabi* crops generally. The rains at the end of October delayed planting, and the rainy weather in February did considerable damage to the crop in the field. In the Khulna district potato cultivation is gradually becoming popular, in consequence of the success attained in the Syedpur Trust Estate. The neighbouring local zamindars are beginning to introduce the crop in their own estates. The District Magistrate, Mr Ahmed, has been taking much interest in the subject, and is arranging to demonstrate the comparative values of the best varieties on a small farm at Khulna. In the Midnapore district the Manager of the Narajole Raj Estate conducted experiments with both Naini Tal and Patna seed, the former giving good results. It is reported that the cultivation of potatoes was unknown hitherto in the Sabang thana of this district, but the cultivators have now taken to it. The crop promised well in the Port Canning Estate and in the Diamond Harbour subdivision of

the 24-Parganas, but it was spoiled by heavy rain in January. In the Murshidabad district the cultivation of potatoes in certain Government estates is said to have proved a failure, but Babu Jogesh Chandra Sen in the same district obtained good results. The Naini Tal variety was tried in the Narail subdivision of Jessore with success. The cultivation in the Patna Government Estates is reported to have been unsuccessful, owing to heavy rain and inefficient preparation of the land. In the Banki Government Estate and the Dompara Wards' Estate in the Cuttack district, experiments with Patna seed are reported to have failed, but no reason has been assigned, and as this variety has given excellent results at the Cuttack Experiment Station, the failure was probably due to want of attention. Potatoes are likely to do well in the sandy loam of the Cuttack and adjoining districts; and seed was distributed under my instructions to several persons from the Departmental Experiment Station during the year, for trial next season.

33. *Wheat.*—Wheat was experimentally tried in the Pakaur subdivision of the Sonthal Parganas, in Birbhum by members of the District Agricultural Association, in Bankura, and in Murshidabad. In all cases the results were either hopeful or successful.

34. *Cotton.*—The results under this heading have been generally unsatisfactory, and point to the uselessness of trying to grow exotic varieties in the damper districts of Bengal.

35. *Sugarcane.*—In Manbhum cuttings of the *khari* and *mango* varieties supplied by the Department were planted, but probably too late, and were attacked by white ants. Still, the raiyats have taken an interest in the cultivation and have of their own accord applied for cuttings for next season. The Hon'ble Mr. Justice Saroda Charan Mitter grew *shamsara* and *rarhi* cane on his farm in the Hooghly district with good results. Mr. E. Milne of Behia, Shahabad, reports that the cuttings of the *Ikri* variety supplied by this Department have done well. Several local zamindars of the Bhagalpur district made experiment in the cultivation of cane with fair results.

36. *Other crops.*—Ground-nuts were successfully cultivated in Palamau, in Birbhum, and by the Hon'ble Mr. Justice Mitter in Hooghly. The latter gentleman was also successful with Central Provinces fine *aus* paddy, cassava and cow-pea. The cultivation of groundnut is extending in the districts of the Orissa Division, and several members of the local Associations have evinced a keen interest in it. The cultivation of jute is also rapidly extending in Orissa.

37. The reports received at present describing the results of experiment and demonstration by local officers and private persons are very defective. Reports have constantly been received to the effect that the seed supplied was not good, or that it was received too late, without any statement to show that germination was tested properly or any note being made of the date on which they were received. Again, many correspondents content themselves with reporting that a certain crop was successful or unsuccessful, without any information as to the conditions under which it was made, and without any comparison with the results obtained from local varieties under similar conditions in the neighbourhood. It is proposed during the current year to issue some general instructions on this subject that will render the information obtained from local experiments of more value and general interest. Mr. D. J. Macpherson, C.I.E., Commissioner of the Bhagalpur Division, in summing up the results of the year in the Government, Wards' and Private Estates in his Division makes the following pertinent remarks: "Sustained effort in the matter of agricultural experiments and improvements is of the very highest importance to the country; but I am bound to say that in my opinion experiments conducted without intelligent, careful and constant supervision are more likely to do harm than good. There is a crying need for the services of trained supervisors to impart clear instructions to all who are ready to make the experiments, and to see that every precaution is taken to carry them on under conditions which will demonstrate their utility; and until the supervision is available I deprecate a continuance of experiments under the conditions disclosed ..... I would confine them for the present to the members of the newly-formed District Agricultural Associations." Already four Divisions have each been provided with a Divisional Agricultural Inspector, one of whose duties should be to give the instructions and exercise the supervision required; and when the results of the

present year's final examination at Sibpur are published, an Inspector will be deputed to the Bhagalpur Division. On the general principle enunciated by Mr. Macpherson, and with which I am in sympathy, a separate communication will be addressed through the Board to Government.

CHAPTER IV.

AGRICULTURAL EDUCATION AND DISTRIBUTION OF LITERATURE AND SEEDS, &C.

38. *Agricultural Classes at Sibpur.*—The year under report was the 8th year of the existence of these classes. There were 9 students in the second year class on the 1st of April 1905, against 14 in the previous year. Of these, 7 were general and 2 special students. At the examination held in November 1905, 7 students passed the final test, obtaining diplomas, and 10 students were promoted from the first to the second year class. For the first time a special student obtained the agricultural diploma. One of the general students of the first year who had failed was admitted to the second year class as a special student, and one of the special students having passed the B.A. examination was transferred to the general list. Fourteen students joined the first year class, 8 as general and 6 as special students, as compared with 7 general and 8 special in the previous year. Of the 8 general students admitted, 2 left the College about the beginning of the sessions. Of the 7 students who obtained diplomas at the last examination, one, namely, Babu Srimonto Kumar Das Gupta, has received an appointment as Deputy Collector, and another, Babu Tarakeswar Bhattacharjee, has been appointed to be a Sub-Deputy Collector.

39. *Agricultural Class attached to the Ravenshaw College and Collegiate School.*—There were 30 agricultural students on the rolls on the 1st April 1905, of whom 6 were from the College. This number rose to 33 in July, and on the result of an examination held in that month, 27 were promoted to the second year class, viz., 6 from the College and 21 from the Collegiate School. The number on the rolls at present is 40, of whom 26 belong to the first year and 14 to the second year class. The average daily attendance during the fifteen months ending in June 1906 was 11·5, which is unsatisfactory. The Principal of the College suggests that some sort of reward or certificate should be granted to the students of the agricultural classes after the final examination, as an inducement to attend regularly and to study seriously. I am not in favour of granting any pecuniary reward. The students receive practical training at the Cuttack Experiment Station from the Superintendent, who is also the agricultural teacher at the College, and who receives an allowance from the Education Department for this additional work.

40. *Agricultural Classes in the Gaya Zilla School.*—All the boys of the Zilla School, except those of the Entrance class and the 8th class, numbering 209, attended agricultural lectures. The attendance was fair, except during the plague season (January to March). Practical lessons on cultivation were given in the school garden. The students were allowed to choose their own crops, and seeds were supplied them. The agricultural teacher here takes a keen interest in his subject, and has done some useful work.

41. *Agricultural Classes in the Dumraon High School.*—Agriculture was taught in the 2nd, 3rd, 4th, 5th and 6th classes of the school. The number of students who received theoretical training in this subject was 148, out of whom 54 attended the practical class. In the lower classes the subject was taught by passed teachers of the Normal School under the supervision of the agricultural teacher. Practical work was done in the school garden of 1⅓ acre. From a recent visit made to this garden, I am not satisfied that the teacher makes the best use of it. Instruction has been given him. The students were also taken from time to time to the local Experiment Station, where the agricultural teacher explained to the boys the various experiments carried on there.

42. *Agricultural Classes in the Hazaribagh Zilla School.*—An agricultural class was opened in connection with the Hazaribagh Zilla School in January 1906. The number of boys on the rolls on the 30th June 1906 was 44. The Overseer of the farm attached to the Reformatory School teaches agriculture in the Zilla School, receiving an allowance for the work.

43. *Agricultural Classes in the Burdwan Municipal School.*—Sixty-three boys of the first four classes of the school attended agricultural lectures, and many of them are reported to have done practical work in their own gardens. The agricultural teacher inspected some of these gardens and was satisfied with the results. The boys were taken several times during the year to the Experiment Station at Pala, and the various experiments carried on there were explained to them. They were also shown the retting and decortication of jute and the process of *gur* making.

44. *The Sabang Sericultural and Agricultural School.*—The school used to be held in a part of the local Middle English School, but during the period now under report a separate school house was built. Both sericulture and agriculture are taught. There is a small garden attached to the school where various crops are grown, such as paddy, jute, *arhar*, *dhaincha*, cassava, tobacco, cotton and vegetables. The Committee have taken a lease of one bigha of land for further extending the mulberry cultivation. The school receives a grant-in-aid from the District Board of Midnapore. The question of improving the utility of this school will be taken up this year in consultation with the District Officer.

45. *Deputation of Students for Agricultural Training in America.*—Four selected passed students were sent out in August 1905 to the United States of America, at the cost of Government, to study agriculture at the Cornell University, Ithaca. Very satisfactory reports have been received from time to time of the progress of these students from the Director of the College, Mr. L. H. Bailey, to whom this Department is much indebted for the very kind interest he has been taking in their welfare. Two more passed students have been selected this year to study agriculture at the same university. These men will find employment on their return in the agricultural service of this Province.

46. *Deputation of Students to Pusa.*—Two passed agricultural students were sent to Pusa during the year for training in Agricultural Chemistry and Mycology under the Imperial expert staff.

47. *Practical Training of the Sons of Cultivators.*—At the suggestion of the Orissa Divisional Agricultural Association, it was arranged to accommodate the sons of cultivators who wished to learn improved methods of agriculture in the labourers' quarters at the Cuttack Experiment Station, giving them a stipend of Rs. 8 per month each. Five such young men joined the farm during the period under report, and one more has joined since the 30th June. Besides these, two sons of petty zamindars have joined this station for instruction at their own expense. They are all taking an active part in the work on the farm. This is a very promising sign. A note on the subject of taking measures to induce cultivators to visit Experiment Stations and Demonstration Farms was prepared and circulated to District Officers. It is proposed to provide special accommodation at the new stations for the sons of petty zamindars and well-to-do cultivators.

48. *Publication of Agricultural Information.*—Five leaflets were prepared and distributed in English, besides a note on the rotation of crops in Bihar. Papers showing the results of the jute experiments, the results of the use of bonemeal and saltpetre as a manure for paddy, and lists of seeds and manures, with ordinary prices and the places where obtainable, were circulated. Such of these papers as are of interest to the mass of cultivators have been translated into Bengali and Hindi and widely distributed. The Orissa Divisional Agicultural Association has done useful work in translating certain papers into Uriya and distributing them in that Division. I have been unable so far, I regret, to start a Departmental Agricultural Journal for distribution in the vernaculars, as my present office staff is over-worked, and I have been unable to secure the services of a suitable officer, with agricultural training, to compile the matter required for such a publication.

The usual preliminary and final forecasts of the various staple crops of the Province were published. The agricultural statistics of the previous year, the prescribed table of average prices of food-grains, etc., for 1904-05 and 1905-06 and the Season and Crop Report for the same years, as well as the schedule of normal rates of prices of food-grains for the quinquennial period ending December 1904 were prepared and published. The compilation of the weekly weather and crop report, the fortnightly report of wholesale prices current and that

of retail prices current was transferred to this Department from the Revenue Department of Government, and the reports were prepared and issued in due course. A weekly telegraphic report, showing the condition of the jute crop in the principal jute districts during the season, is now prepared and issued from this office.

49. *Supply of Seeds, Manures and Implements.*—It has been decided by Government that the Director of Agriculture should assist the members of the local agricultural associations and the public in procuring improved varieties of seed and improved agricultural implements. For this purpose a seed and implement store was, as already stated above, established during the year. It was opened on the 1st of February. During the 12 months from the 1st July 1905 to the 30th June 1906, some 1,437 maunds of seeds of various kinds and 1,020 maunds of manures, besides a large quantity of cuttings of sugarcane and cassava, were distributed by the Department. The heavest issues were of Naini Tal potatoes, Patna potatoes, jute seed (163 maunds) and sugarcane cuttings 286,000. Of manures, castor cake (420 maunds) and bonemeal (379 maunds) show the largest issues. I have devoted much time in trying to systematise the work of distribution from this store and to avoid the complaints hitherto made as to delay in compliance with indents. For the guidance of the Superintendent, a list has been drawn up showing, in the case of each kind of seed to be stocked, the earliest date of sowing in Bengal and Bihar, the seed rate per acre, the latest date for receipt of indent, and the date on which steps should be taken to obtain a stock. The Superintendent of the Store, Babu S. N. Bhattacharjya, has done excellent work so far.

CHAPTER V.

Agricultural Associations and Agricultural Shows.

50. *Agricultural Associations.*—It was decided by the Bengal Provincial Agricultural Association to continue during the year the system of establishing special farms for the production of selected jute seed. Four such farms of much larger areas than in the previous year were opened, as stated in paragraph 19 above. Steps were taken to compile a list of suitable books of reference on Agricultural and Industrial subjects for the use of the Association. These books have now been procured from Europe and America and locally. A Librarian was engaged to arrange them according to subject and author's name, and to prepare a complete catalogue. This work has been finished, and the catalogue is in the press. A very fair library of books of reference has been formed, arranged in almirahs in the Director's room which is fortunately large enough to hold the collection at present. Excluding spare copies, the collection contains at present some 4,200 books of reference, journals and bulletins. One set of keys is kept with the Head Assistant to the Director of Agriculture, and one set by the Secretary to the Association. It has been arranged that the Central Association should peruse the programmes of work proposed to be undertaken by local Associations and give advice and make suggestions thereon, with a view to maintaining a system of co-operation and inter-communication.

51. Divisional Agricultural Associations have been formed in all Divisions, except Bhagalpur, under the presidency in each case of the Divisional Commissioner. Agricultural Associations have also been formed during the year in almost every district, which work in co-operation with, and under the general supervision of, the Divisional Association where there is one. Steps have been taken to encourage each district Association to draw up a definite programme of work, and the formulation of general principles for the guidance of these Associations and the preparation of a list of items of demonstration work recommended by this Department has been taken in hand. A sum of Rs. 1,000 was placed at the disposal of the President of each Divisional Association and of the Commissioner of the Bhagalpur Division, for distribution among the district associations to enable them to start actual work. Divisional Agricultural Inspectors were appointed from the passed students of the Sibpur agricultural classes to the Divisional Associations of Patna, Orissa and Burdwan, to act as expert advisers on all questions that may come before the Association, and assist

the members of local Associations in their work. They work under the immediate orders of the President of the Divisional Association and under the general supervision of the Director. Since the close of the year an Inspector has been deputed to the Presidency Division; and as soon as qualified men are available similar appointments will be made in the remaining Divisions.

52. Much progress was made during the year by the Patna Divisional Association, owing chiefly to the interest shown by Mr. Levinge, the Officiating Commissioner, and the zeal of the local Secretary, Babu Purnendu Narayan Singh. Good work was also done in Orissa and in Burdwan. The other Divisions have been handicapped by not having expert Inspectors attached; but I must express my obligations to each of the Commissioners for the ready help they have given the Department. Of District Associations, Birbhum, Khulna Bankura and Howrah have shown considerable activity. A small collection of standard works on Agricultural subjects has been supplied to each Divisional Agricultural Association, to serve as the nucleus of an Agricultural Library for the use of members.

53. *Agricultural and Industrial Fairs and Exhibitions.*—A brief account of each of the chief fairs and exhibitions held during the year is given in Appendix V. The total sum of Rs. 3,150 was distributed during the year in financial aid to a number of these exhibitions. Many of them are doing useful work and are helping to diffuse a knowledge of the results of the working of the Department. Every possible encouragement is being given them. An increased allotment has been sanctioned by Government during the current year for grants-in-aid. Arrangements have been made to maintain two small collections of implements, seeds and manures to be taken round to these shows by an officer of the Department competent to explain and demonstrate their uses. A list of such exhibitions has been drawn up with the proposed dates obtained from the District Officers, and circulated in order that the local Committees of management may be in a position to see on what dates similar exhibitions are likely to be held in other districts, and, if, necessary, to arrange that the dates may not coincide. In previous years considerable delay occurred in the payment of the grants-in-aid, owing to the fact that each case had to be separately submitted through the Board to Government. I have obtained the authority of Government now to sanction grants up to a maximum limit of Rs. 300 in any one case. I have tried to arrange that some officer of the Department, either myself or the Deputy Director or Mr. Mukherji, should attend each show, and that practical demonstrations and addresses on Agricultural subjects should be given.

CHAPTER VI.

Miscellaneous.

54. *Crop-cutting Experiments.*—The results of crop-cutting experiments conducted in different districts of the Province during the two years 1904-05 and 1905-06 have been compiled in my office, and will be discussed when submitting the next quinquennial report to Government, which is not due till the 1st of January 1907. Four hundred and thirty-six experiments were made on irrigated crops, and 1,385 experiments on unirrigated crops. These figures do not include experiments conducted in the districts transferred last year to the new Province of Eastern Bengal and Assam. The rules for the conduct of crop-cutting experiments were revised during the year.

55. *Entomology.*—Little or no damage was done by locusts during the period under report. A flight of locusts passed over the district of Palamau, but caused no loss, there being no standing crops in their line of flight. These insects appeared in the Muzaffarpur district and in the Godda Subdivision of the Sonthal Parganas in June last; but they are reported to have done very little harm. In Palamau district a good deal of damage was done by larvae to the paddy seedlings, and to *marua* and maize in August 1905. An Entomological Assistant was deputed from Pusa to the locality. In the Narail Subdivision of the Jessore district some damage was done to the tender *aman* paddy plants in September 1905 by certain insects which were reported to appear with wet weather and to disappear in strong sunshine. These were identified by the Assistant Entomologist attached to this Department as

the rice *hispa*. These insects are locally known as *shain* and *shanki* in Jessore, *paruli* in Khulna, and *shanki* and *majari* in the 24-Parganas. Some slight injury was done to the *sarad* paddy in the Kendrapara Subdivision of the Cuttack district in August and September by insects locally known as *gari kata* or *gorinda*, and in the Sadar and Banki Subdivisions by stem-borers. The Assistant Entomologist visited these localities, and specimens were sent to the Imperial Entomologist at Pusa through an Assistant deputed from that institution. Severe damage was caused over an area of about 250 bighas in the Jehanabad Subdivision of the Gaya district by some pests that attacked the gram, linseed, *khesari* and *masur*. Specimens of the larvae were forwarded to Pusa. The Assistant Entomologist was deputed in April 1906 to study a cane-borer which had attacked the sugarcane in the farm at Cuttack. He has submitted a report of his investigation of the life-cycle of this pest to the Imperial Entomologist. Three different varieties of jute pests have also been examined, viz., black hairy caterpillars found in the Hooghly district, green caterpillars found in the same district, where it is known as *gori poka*, and loopers of a bluish-green colour known as *ghora poka*, *dora poka* and *jora poka* in various parts of Jessore, *gore poka* in some parts of Nadia, and *tirhing* in some parts of Khulna. These loopers did considerable damage in some places by eating the top-shoots of jute. Specimens of each are being reared. The Assistant Entomologist was also able to study two pests doing considerable damage to *cucurbita pepo* and *ficus hispida* in some gardens in Howrah. He worked for some time in the Entomological section of the Indian Museum, but he has recently been provided with a small laboratory outfit of his own. The Imperial Entomologist has kindly issued necessary instructions for the guidance of this officer pending the arrival of an Entomologist for this Province. The Deputy Director of Agriculture has been directly supervising his work.

56. *Sericulture.*—The Bengal Silk Committee continued to do useful work. The Local Government increased its contribution during the year 1905-06 to Rs. 15,000. Owing to the transfer of certain important silk districts to the new Province of Eastern Bengal and Assam, the contribution was reduced to Rs. 10,000, with effect from the 1st of April 1906. Seven model rearing houses or "nurseries" have now been established by the Committee, viz., four in the Murshidabad district, two in the Rajshahi district and one in Birbhum district. Four more are in course of construction in Murshidabad. A large number of rearers were instructed in the use of microscopes by the Sub-Overseers employed by the Committee. Nine microscopes and three vaporisers were sold or lent to rearers during the year, besides a considerable quantity of sulphate of copper, sulphur and thread nets. It is reported by the Committee that in Birbhum district the rearers are now satisfied of the benefit to be derived from the microscopic examination seed, and that fumigation, etc., is being adopted by a considerable percentage of the rearers. In this district Mr. W. Val Weston, Manager, Gonatea division of the Bengal Silk Company, who takes a keen interest in sericulture, has given much assistance by distributing disinfectants, and by organising a local Committee to promote the use thereof. The nursery at Rammati in this district has been of great service to the local rearers, and has shown a clear profit, after paying for the salaries of the Sub-Overseers, the establishment, mulberry, labour and all other contingencies. In the Murshidabad district the nurseries at Rajdharpur and Benidaspur have done very favourably, the results of the seed distributed from them being satisfactory, and each having shown a clear profit after paying all expenses. Another nursery has recently been opened at Mamudpur, and four others are practically finished. Babu A. K. Ghosh, Sericultural Superintendent, has done good work during the year. The whole subject of the present conditon of the silk industry in this Province has been under the consideration of Government, with the result that a special small committee was appointed to enquire into the causes of the decline, and suggest remedial measures. The committee have recently concluded their work, and submitted their report.

57. Sericultural operations made considerable progress during the year in the Tributary States of Morbhanj and Keunjhar. In Morbhanj there are now over 40 acres under the Bengal shrub mulberry and about 18 acres under tree mulberry. Rearing and reeling, chiefly from the Bombyx meridionalis variety of Mysore is being carried on satisfactorily. The State of Dhenkanal has also recently started a mulberry plantation, with a view to the establishment

of the silk industry. These States are showing an enlightened policy in regard to sericultural and agricultural development.

58. *Indigo.*—Government continued during the year the grant of Rs. 50,000 for research work in Indigo to the Bihar Indigo Planters' Association. The Research Station at Sirsia is now fully equipped, and the buildings have been completed, with the exception of a bungalow for a botanist which is under construction. The present staff consists of Messrs. Bergtheil, (Imperial Bacteriologist on deputation from Pusa), Briggs and McGregor. Mr. R. S. Finlow was also engaged on Indigo work in July, August and September 1905. The Government grant is administered by a special Advisory Committee, consisting of six members, who held 14 meetings during the period under report. All these gentlemen have shown the keenest interest in the working of the station, and their attendance at the meetings in all weathers has been exemplary. Altogether the Committee has done very good work under the able direction of Mr. T. R. Filgate, Secretary of the General Committee of the Bihar Indigo Planters' Association. The following reports and notes were published during the year:—

(1) A note on testing the germination power of seed.
(2) Note on the results obtained with Java Indigo.
(3 On harvesting Java Indigo seed.
(4) Note on Java seed supply.
(5) On the treatment of Java Indigo seed with sulphuric acid to promote germination.
(6) On pruning Java Indigo.
(7) Report of the Indigo Research Station for 1905-06.

59. A short account of the scientific work on indigo carried out during the year has been printed as an appendix (VI) to this report: it speaks for itself. I need only say here that much valuable work has been performed by Mr. Bergtheil and his assistants. Very encouraging results continue to be obtained from Java-Natal seed, and so far the prediction of deterioration has been falsified. A well organised system of seed farms has been established, and most of the planters are going in for the Java-Natal seed with more or less enthusiasm. So far the prospect of success is favourable.

60. *Arboriculture.*—During the year under report I received instructions to prepare a Manual of Arboriculture for this Province, in consultation with the Conservator of Forests and the Superintendent of the Royal Botanic Garden, Sibpur. This work has involved considerable enquiry and correspondence with local officers, and has had to be carried on in addition to the ordinary work of the Department. The Manual will be submitted in the current year. A scheme has also been prepared in consultation with the Superintendent of the Royal Botanic Garden for the training of District Board Overseers and Sub-Overseers in arboriculture. This is now under the consideration of Government. The Director of Agriculture has been appointed by Government to be the central authority to arrange for the supervision, administrative and financial, of the arboricultural work of the District Boards. He has also been assigned the duty of inspecting and advising upon all arboricultural operations under Government Order No. 3942, dated the 18th of November 1905.

61. *Emigration to Burma.*—The number of State emigrants carried from Bihar to Burma during the year under report was 1,477 (1,150 adults and 327 children), as compared with 421 in the previous year. The increase is remarkable, and is attributed to the fact that the people are only beginning to realise the advantages of taking up land in Burma, and to overcome the scruples felt for so many years. The majority of the emigrants were Koiris; but most of the lower castes were represented, and even the Rajput and the Brahman caste. Babu Hari Prasad Singh of Dumraon refers to the existence of a hostile feeling towards the Indian settlers on the part of their Burman neighbours. It is to be hoped that this feeling will subside. The Managing Agents of the British India Steam Navigation Company report that the arrangements made for the conveyance of the emigrants have worked satisfactorily throughout, and that no complaints have been received of emigrants being put to any trouble or inconvenience on the voyage. The conditions of emigration were the same as in the previous year.

62. *Provincial Museums.*—Additions were made to the Natural History Museum at Darjeeling in all branches. A Taxidermist and an Assistant Taxidermist were permanently employed during the year. The Committee have taken much interest in the work of the museum. The small museum at Dumraon continued to be under the superintendence of the Farm Overseer, but when I last saw it, I had to express dissatisfaction at the want of attention disclosed. The small museum at Monghyr referred to in last year's report consists merely of a small collection of seeds.

63. *Miscellaneous enquiries and experiments.*—The charges incurred by Government on account of miscellaneous enquiries and experiments amounted to Rs. 46,897-7-11, against Rs. 12,260 in the previous year. The totals will be found in Appendix VII. The chief causes of this marked increase are:—The deputation of Mr. Finlow on enquiries in connection with jute, and the deputation of Messrs. N. G. Mukherji and N. N. Banerji on special duty for the greater part of the year. The expenditure on seeds, manures, and implements has also very largely increased, owing to the rapid development of the seed and implement store work.

64. *Officers of the Department.*—The Deputy Director of Agriculture, Mr. F. Smith, B. sc., has worked with conspicuous zeal throughout the year. He has exercised constant and able supervision over the Experiment Stations and jute farms under his charge. I am obliged to him for his cordial co-operation and help. My thanks are also due to Messrs. N. G. Mukherji and N. N. Banerji, who are no longer officers of the Department, for the work done by them during the period under report, both as Assistant Directors of the Department, and since the 1st of April last as officers on special duty. Mr. D. N. Mukherji, Assistant Director, and since the 1st of April, Personal Assistant, has been ordinarily in charge of the office at head-quarters, and has worked with his usual assiduity. Mr. Alim, Travelling Inspector, has done useful work in connection with the improvement of cotton cultivation; and, with a few exceptions, the office staff have worked well.

I take this opportunity also of gratefully acknowledging the constant assistance rendered to the Department by Dr. J. W. Leather, Imperial Agricultural Chemist. The thanks of the Department are also due to the Bengal Chamber of Commerce for help courteously given.

I have the honour to be,

SIR,

Your most obedient servant,

C. A. OLDHAM,

Director of Agriculture, Bengal.

APPENDICES.

APPENDIX I.

Jute Seed Experiments, 1905.

The Bengal raiyat obtains his jute seed generally from the weakest and most stunted plants in the field. This process, carried on throughout years, as has been the case, cannot have resulted in the production of the strongest plants. In fact many ravages of the jute crop caused by insect and fungoid pests, may be traced to a loss of vitality in the plant. This loss of vitality, and consequently want of power to resist disease, may be put down to this unscientific method of obtaining seed.

Jute is such an important crop in Bengal, and its future commercially so brilliant, that the necessity of obtaining a good supply of seed is self evident.

In order to obtain an improved and more prolific seed, a system of seed selection was carried out in 1905 at Rajbari (Faridpur), Gouripur (Mymensingh), Rangpur and Jalpaiguri. Seed in the first place was purchased from local raiyats and submitted to a germination test.

A Jute Inspector was appointed to supervise the four centres, but the work was too much for one man and had he not been helped at three of the centres by other interested workers, the whole experiment would have been a failure.

Seed was sown in the usual way in April. When plants were 1 inch to 2 inches high, the surface of the soil was broken up by means of the *bida*. When plants were 6 inches high they were thinned out in rows 2 feet apart and 1½ feet apart in the rows. Where necessary and possible the space between the rows was cultivated. The resulting plants were large branched ones in contradistinction to the tall one-stemmed plants that are necessary for fibre. The crop was harvested in October, dried and threshed. Seed was collected, bagged and sent to Calcutta whence it has been sent to the four new seed farms and to certain cultivators.

A second method of producing seed.

To test this system of selection, at two centres, Mymensingh and Rangpur, areas of standing jute (*i.e.*, jute for fibre) were bought and allowed to produce seed only. No statement can be made as yet as to which is the best method of producing seed. In 1905 the standing jute yielded the highest outturn; but it would be premature, before having 5—10 years results, to come to any conclusion. The prolificness of the seed is also being taken into consideration.

The following table gives full particulars of the experiment:—

No.	Centre.	Variety of jute.	Area in acres.		Yield of seed.		Remarks.
			Cultivated by Agricultural Department.	Standing jute purchased.	Actual outturn.	Yield per acre.	
1	2	3	4	5	6	7	8
			Acres.	Acres.	Mds. srs.	Mds. srs.	
1	Gouripur (Mymensingh).	Barapet of Serajganj ...	0·33	...	0 34	2 22	Badly affected by a greenish caterpillar and a fungoid pest resembling the wilt disease of *arhar*.
		Kakya Bombai (C. C.) ...	0·33	...	0 27½	2 2½	
		Deswal of Serajganj (C. C).	0·83	...	0 25	0 30	
		Amonia of Mymensingh (C. Capsularis.)	1·67	...	2 33	1 27	
		Amonia of Mymensingh ...	...	1·57	6 25½	4 9	
2	Rangpur	Deswal of Serajganj (C. C).	0·66	...	1 30	2 5	
		Amonia of Mymensingh (C. C).	0·19	...	0 25½	3 14	Slight attack caterpillar.
		Hewti white of Rangpur (C. C.)	0·62	...	2 30	4 17½	
		Ditto ditto ...	0·83	...	2 20	3 0	
		Ditto ditto ...	...	0·5	4 8	8 16	
3	Jalpaiguri ...	Deswal of Serajganj (C. C).	1·13	...	2 2	1 32	
		Hewti of Jalpaiguri (C. C).	0·25	...	0 27	2 28	
4	Rajbari (Faridpur).	Sarnala of Faridpur (C. Olitorius).	2·58	...	1 24½	0 25	Attacked by caterpillar.

Gouripur.—At Gouripur 3·16 acres were chosen on the Gouripur Experimental Farm and treated in the above manner. 1·57 acres of excellent standing jute were purchased and allowed to produce seed. The standing jute yielded the heaviest outturn of seed. The farm lands were very badly attacked by a caterpillar and by a fungoid pest resembling the wilt disease of *arhar*. Deswal and Amonia varieties in particular were very badly attacked.

Rangpur.—2·3 acres of the land of the Experimental Farm were taken for the experiment. Half an acre of first-rate standing jute was purchased from a neighbouring raiyat and allowed to produce seed. The standing jute yielded the heaviest outturn, still the careless manner in which the crop was handled from harvest time onwards makes this point doubtful. Hewti white gave the highest yield. This is the local variety.

Jalpaiguri.—1·38 acres were chosen on the Baikunthapur Estate, Jalpaiguri, for carrying out this experiment. The resulting plants were exactly what had been conjectured. *The crop was a splendid one*, though the outturn was only fair. This was due to improper supervision.

Rajbari—At Rajbari (Faridpur) 2·58 acres of land were chosen from local raiyats. An arrangement was made with the raiyats to cultivate the crop according to instructions—full compensation, which was agreed upon beforehand, to be paid by the Agricultural Department. The results were, practically speaking, a failure as the raiyats would not fulfil their share of the contract. They neglected the crop. *Ohtorius* variety was grown here.

F. SMITH,

Deputy Director of Agriculture, Bengal.

APPENDIX II.

Results obtained by the use of bonemeal and saltpetre as manure for paddy in 1905 in the case of certain raiyats who compared the outturn with that obtained from unmanured plots.

(Showing the value of the increased yield as compared with the cost of manuring.)

Serial No.	Name of Raiyat.	Name of village.	Outturn of grain per bigha.		Increase from manuring per bigha.	Value of increase per bigha.	Remarks.
			Manured.	Unmanured.			
1	2	3	4	5	6	7	8
			Mds. Srs.	Mds. Srs.	Mds. Srs.	Rs. A. P.	
1	Bonat Ali Biswas ...	Boalmari ...	8 24	6 0	2 24	5 3 0	(1) Cost of manuring in each case was Rs. 3-14 per Bengal bigha.
2	Satar Ali Joarder ...	Chuadanga ...	9 24	7 8	2 16	4 13 0	
3	Ramjan Biswas ...	Belgachi ...	21 10	6 0	15 10	30 8 0	(2) The manures were applied at the rate of one maund of bonemeal and 10 seers of saltpetre per bigha.
4	Ebadat Joarder ...	Chuadanga ...	7 8	4 30	2 18	4 14 0	
5	Aftab Hossen Joarder	Ditto ...	9 24	6 0	3 24	7 3 0	(3) Nos. 1 to 5 relate to *aus* paddy in the Chuadanga sub-division, district Nadia.
6	Chandi Charan Das, .	Becharhat ...	8 16	5 36	2 20	5 0 0	(4) Nos. 6 to 13 relate to *aman* paddy in the neighbourhood of the Burdwan Experiment Station.
7	Mohim Shaikh ...	Sankapur ...	9 30	4 35	4 35	9 12 0	
8	Ram Mandal ...	Becharhat ...	8 24	6 24	2 0	4 0 0	
9	Bhuban Sarkar ...	Ditto ...	10 0	6 32	3 8	6 6 0	
10	Radha Madhab Ghosh	Ditto ...	8 16	6 0	2 16	4 13 0	
11	Khetoo Pandit ...	Ditto ...	12 20	8 0	4 20	9 0 0	
12	Hari Krisio Pandit ...	Ditto ...	13 0	6 20	6 20	13 0 0	
13	Durlar Mandal ...	Ditto ...	9 0	6 0	3 0	6 3 0	
		Average ...	10 18	6 8	4 10	8 8 0	

APPENDIX III.

A list of Agricultural Implements and Machines which have been tested in Bengal during the period from 1st April 1905 to 30th June 1906, and of those in use which are reported to have met with more or less success.

Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by native agriculturists.	Remarks.
2	3	4	5	6	7	8	9	10
			Rs.					
Behia three roller sugarcane mill.	Crushing sugarcane.	Efficient	70 to 125	Messrs. Thompson and Mylne of Behia, Shahabad.	Commissioners of the Burdwan, Patna and Orissa Divisions and Deputy Commissioner of Palamau.	Juice can be extracted in a short time with little labour and expense. The utility of those mills is much appreciated by raiyats.	397 sold during the year. Used widely.	
Shallow evaporating pan.	Boiling sugarcane juice.	Efficient	15 to 20	Ditto ...	Commissioners of the Patna and Orissa Divisions.	Large quantity of juice can be boiled at a time and the scum removed easily.	Used widely.	
Sibpur plough ...	Deep ploughing, breaking the soil and inverting it.	Provided with a curved board which inverts the soil.	7	Bengal Agricultural Department.	Ditto ...	Too heavy for ordinary bullocks of the District of Angul and is used in the demonstration farm only.	Not used by local cultivators.	
Meston plough ...	Ploughing ...	Efficient	5	Director of Land Records and Agriculture, United Provinces.	Commissioner, Burdwan Division.	.....	.....	
Bakhar	Levelling and scarifying.	It levels the soil, breaks clods, stirs subsoil and collects weeds.	2	Bombay Agricultural Department.	Commissioners of Burdwan and Patna Divisions.	.....	Not used by local cultivators.	
Hand rake ...	Cultivating and breaking crust.	Worked by hand	2	District of Champaran.	.....	Very useful ...	Seldom used by cultivators.	
Winnower ...	Winnowing cereals	Worked by hand	235	Calcutta ...	Commissioner of Patna Division.	Very useful, but too expensive.	.....	
Chaffcutter ...	Cutting fodder ...	Worked by hand	40 to 60	Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	Fodder can be cut fine at a smaller cost than with the local *garasi*.	Used by well-to-do zemindars.	
Corn crusher ...	Crushing corn ...	Worked by hand	155	Messrs. Jessop & Co.	.....	.....	.....	
Iron *don* ...	Lifting water form small depth.	Lighter and more durable than wooden *don*.	8	Rampurhat, District Birbhum.	Commissioner of Patna Division.	.....	Cheaper wooden *don* is used by cultivators, but they appreciate this *don*.	
Hatchet for cane cutting	Sugarcane cutting	.....	18 per doz.	Messrs. T. E. Thomson & Co., Calcutta.	T. B. Rutherford, Manager. Ramkola Estate.	Most useful ...	.....	
Kattha Roller ...	Breaking big clods	.....	12 ,,	Can be made by a village carpenter	Commissioner, Patna Division.	Ditto ...	.....	
Digging forks ...	Cultivating and lifting tubers.	Very useful in the rainy season for breaking crust.	24 ,,	Champaran District.	Ditto ...	.....	.....	
Sugarcane mill ...	Crushing sugarcane.	Very efficient ...	90	Ram Narain Banerji & Son, Howra.	H. Foster, Esq., Collector of Birbhum	More efficient than the Behia mill.	.....	

APPENDIX IV.

Experiment Stations.

Burdwan.—At this station study is being made chiefly of two crops, namely, paddy and jute. The Badshahbhog, Dadkhani, and Kamod varieties of paddy have given the best results in the variety experiments; while three maunds of bonemeal and thirty seers of saltpetre per acre have proved so far to be the best manure for aman paddy for the local soil. The remarkable results obtained with this manure during a series of years have been previously published, and have led to the more extended trials already referred to in paragraph 29 of the Report. In the case of jute, the Deswal and Kakyabombai varieties of Sirajganj, and the Baran and Barapat varieties of Mymensing have given excellent results for two years now on considerable areas. As a manure for jute, 100 maunds of cowdung has given the best outturn. At this station, also, the Naini Tal and Patna varieties of potato have been proved to be profitable varities to grow.

The total expenditure on this station amounted to Rs. 4,593, and the receipts to Rs. 1,643, as compared with Rs 3,002 and Rs. 1,651 in the previous year, the net cost being Rs. 2,950 against Rs. 1,351. The figures for the period under report, however, include the cost on the jute cultivation during the current season, whereas the receipts on account of jute will be credited during the present year. The charges on account of this farm are generously borne by the Maharaja-Dhiraj Bahadur.

Dumraon.—Sugarcane and wheat are the principal crops that are being dealt with at this station. The Khari variety of cane has proved to be much hardier than others. The wheat experiements have shown that the Muzaffarnagar white and the Red Deshi wheat of the United Province give better results than the local varieties. The teaching of this farm may be said to have led to the extended cultivation of the Muzaffarnagar variety in Bihar. Indents for this seed are constantly being received. The Sukavel variety of paddy from Bombay has also given encouraging results, and has attracted the attention of the cultivators of the vicinity, who have been applying to the Overseer for seed. The total expenditure on account of this station during the period under report was Rs. 3,200 against Rs. 2,513 in the preceding year, and the receipts amounted to Rs. 1,204, against Rs. 675, showing a not cost of Rs. 1,995, as compared with Rs. 1,138. The whole cost is borne by the Maharani Sahiba of Dumraon, to whom the thanks of the department are due. In order to expedite the payments of salaries and other charges, the Manager has kindly consented for the future to deposit a lump sum in the treasury from which the Overseer can draw, instead of having to submit each bill to the Raj office for order of payment, a system that has led to a good deal of delay in the past. The Department is indebted for this improvement to the co-operation of the manager, Babu Shiu Saran Lal.

Sripur.—At this station the principal work is being done with maize, oats and *juwar*. The Saran marl has shown itself to be very poor in phosphoric acid, and should respond readily to phosphatic manures, such as bones and superphosphate. The Jaunpur variety of maize and the Hissar variety of oats have proved to be better than the local varieties. The local variety of *juwar*, on the other hand, gives an excellent crop of fodder. These points are commended to the attention of the cultivators of the district. Experiments in cattle breeding are also being carried out at this station. This part of the work is under the supervision of the Veterinary Department. Several changes have been made in the administration of this station, and a scheme has been prepared under the instructions of the Board for largely reducing the net cost to the Hathwa Estate, and submitted to the Commissioner of the Division: no useful comparison can, therefore, be made of the expenditure during the past two years. The new Superintendent of the farm, Mr. Mackenzie, has made a good start, and the Manager of the Hathwa Estates, Mr. Ogilvy is taking a keen interest in the operations.

Cuttack.—This experiment station is maintained at the cost of Government. The most important work is being done with paddy, jute and potatoes. The soil of the district is exceedingly poor in nitrogen and potash, and it has been fully shown that suitable manuring will pay well. The cultivation of jute, potatoes and ground nut has been proved to be profitable. The example of the farm has already led to the extension of the cultivation of ground nut in the Cuttack and Balasore districts. Patna potatoes did excellently last year, and a quantity of seed tubers were distributed from the produce. Jute is very rapidly extending in the district. The Deswal variety is recommended for cultivation: and for manure, the following:—

Cowdung	...	... 100 maunds	per acre.
Superphosphate		... 2 „	
Saltpetre	...	... 1 „	

This station, which was so ably laid out and started by Mr. Maddox at the beginning of 1904 only, has already done useful work, and gives good promise for the future. At a meeting of the Divisional Agricultural Association held in January last, which the Director of Agriculture attended, it was held that no more suitable site could probably be obtained for an experimental station, as representative of the agricultural conditions of Orissa. It has been decided, therefore, to enlarge the present farm by the acquisition of adjoining lands, to form an experiment station under the reorganisation scheme. Perhaps the most encouraging feature in connection with this station is that, as a result of the good influence of the members of the Divisional Agricultural Association, six young men in the receipt of

stipends have taken up their residence on the farm, to learn the methods followed there, and two have joined at their own expense. They take part in the work on the farm, and live in the labourers' quarters.

The charges on account of this station during the period under report amounted to Rs. 6,787, and the receipts to Rs. 1,865. Several improvements were carried out during the year, such as the construction and raising of roads, cutting drains, numbering of the plots with stone slabs and levelling plots, which necessarily raised the expenditure; but the chief cause of the increased charges was that a sum of Rs. 1,700 had to be spent on reconstructing and re-roofing the cattle shed which was blown down by a high wind. A similar fate has since befallen the manure pits, the roof having collapsed. These two buildings had been constucted under the supervision of the District Engineer. The receipts have risen by Rs. 636, which is satisfactory.

Sibpur.—This station is under the management of the Educational Department, and is now maintained chiefly for the instruction of the agricultural students at the Civil Engineering College. The experiments of previous years on the manuring of jute, paddy, sugarcane, and potatoes were continued. For the last three years the application of 10 maunds of castor cake has given the heaviest outturn of grain and straw in the case of paddy, but a larger net profit has been obtained by using 150 maunds of cowdung per acre. In the case of sugarcane, 10 maunds of castor cake per acre gave the best return. With potatoes, 20 maunds of castor cake gave the heaviest outturn. In the variety experiments with paddy, Dudhkalma gave the heaviest yield, but this is a coarse rice. Taking both yield and market value into consideration, Samudrabali gave the best result. The Naini Tal variety of potato continued to show its superiority. The income of the farm during the year ending on the 31st March was Rs. 1,116, as compared with Rs. 1,064 in the preceding year; and the expenditure amounted to Rs. 3,620, or the same as in the previous year.

APPENDIX V.

Exhibitions and Fairs.

Suri Cattle and Produce Show.—This exhibition has been held now for 10 years. It is managed by a Committee of local gentlemen under the presidency of the District Magistrate. It was opened this year on the 8th February, and lasted for four days. Of the exhibits brought to the show, tree cotton, lac ware, fabrics made from silk, cotton and tasar deserve special mention. The Deputy Director of Agriculture, a Travelling Inspector of this Department, the Superintendent of the Civil Veterinary Department, and an Assistant and an Inspector of that Department, were present at the show, and helped the Judging Committees with their advice. The Agricultural Inspector demonstrated to the raiyats present the working of the Meston plough and other implements, including diary appliances. The working of a fly-shuttle loom was also explained to the raiyats. The show was a success.

A sum of Rs. 200 was contributed from Provincial funds in aid of this exhibition, and Rs. 100, and two silver medals were sent to the Committee as an Imperial grant for special prizes for country-bred cattle, but the money and medals from the cattle grant were not fully distributed, owing to the absence of eligible exhibits.

Bihta Cattle Show.—This year's show was held on 21st February at Bihta in connection with the *Sivaratri mela*. But owing to very bad weather the number of entries was comparatively small. Captain Trydell, Superintendent of the Civil Veterinary Department, with Mr. D. Quinlan, I.C.V.D., attended the show and helped the Judging Committee with their advice. The average quality of the cattle brought to the show was poor. No medal was awarded to the exhibitors of bulls and cows, which were below the standard required. Rs. 100 were given in aid of this show from Provincial funds, and Rs. 200 and two silver medals were allotted from the Imperial grant for special prizes at cattle shows.

As in previous years, Babu Debi Lal, Honorary Secretary to the Exhibition Committee, is reported to have worked very energetically.

Khagra Cattle Show.—The show was held on the 18th January 1906. There was a large attendance of cattle owners, besides the usual crowds that come to see the show. The Collector of Purnea presided over the Judging Committee. The classes of local breeds, as has always been the case, were poor, but were more numerous than last year. The cows of Purnea district are exceedingly small. Rs. 100 were given for special prizes to cattle from the Imperial grant.

Sripur Cattle Show.—This year the cattle show was held on the 12th and 13th January at Huseypur, 4 miles south-west of the Sripur Farm. It was a distinct improvement upon last year's show, owing to the arrangements made by Mr. Ogilvy, the Manager, Hathwa Raj. The competition for prizes was keen, and the quality of animals exhibited was fair. The Director of Agriculture, the Superintendent of the Civil Veterinary Department, and the Collector of Saran were present. Out of the Imperial grant, Rs. 100 and two silver medals were allotted to this show for special prizes, but the prize money and medals were withheld for want of exhibits of sufficient merit. This show is becoming appreciated by the local public.

Sonepur Fair.—This is the largest cattle fair in the Province. It is held about the full moon day in November each year, and usually lasts for about a fortnight. This year it commenced on the 5th November, but owing to an outbreak of cholera the *mela* broke up early (on the 17th). The estimated number of animals brought to the *mela* for sale was—elephants 1,000, cows 575, bullocks 20,600, horses 2,185, ponies 2,025, buffaloes 566, camels 35. Of these, about 3,000 horses and ponies, 500 elephants, 417 cows, 432 buffaloes and 15,300 bullocks changed hands. The Bihar Industrial Exhibition was held at the fair, and was a success. It was attended by the Director, the Deputy Director and one of the Assistant Directors of this Department. The judging of animals for the prizes, and the distribution of the prizes was held on the 11th November. The Superintendent of the Civil Veterinary Department and the Collector of Saran were present and helped the Judging Committee. A sum of Rs. 200 was contributed by Government from Provincial funds in aid of the cattle show, and a like sum was given from the Imperial grant for special prizes, but animals of sufficient quality not being exhibited, the whole of the Imperial grant was not spent.

Purulia Agricultural and Cattle Show.—An Agricultural and cattle show was started last year at Purulia with a view to the improvement of agriculture, industries and cattle breeding in the district. This year it was held on the 1st, 2nd and 3rd February. Prizes were awarded for cattle, crops, vegetables, fruits, tasar silk, agricultural implements, poultry, brass and bell-metal ware, raw and manufactured lac and cotton. About 10 to 12 thousand people visited the show. The total amount of subscriptions raised was Rs. 1,977, including the Government contribution of Rs. 300. Out of this sum, Rs. 1,511 was spent, and the balance has been kept in deposit with the Secretary and Treasurer to the Exhibition Committee for expenditure next year. On the whole the exhibition was a success, though the number of exhibits was not large.

Baraset Agri-horticultural Exhibition.—This exhibition was opened on the 29th January by Mr. J. H. Bernard, District Magistrate of the 24th Parganas. Various kinds of grains and vegetables were shown. A few specimens of different kinds of jute of excellent growth and of cottons experimentally grown in the Subdivision were exhibited. Prizes were awarded to the successful exhibitors; Rs. 100 was paid out of the provincial grant in aid of this exhibition.

Barahpur Agricultural and Cattle show.—This show was held from the 16th to 22nd February 1906, at Barahpur in the Buxar Subdivision of the Shahabad district. This year the *mela* was poorly attended, owing chiefly to the bad weather. Rupees 150 were paid from the Imperial grant for special prizes and a like amount from the Provincial fund. It was attended by the Director of Agriculture and by the Superintendent, Civil Veterinery Department. The quality of the animals exhibited was generally poor. A small agricultural and industrial show is held in connection with this fair, and prizes awarded for the best exhibits. The arrangements for the show might be improved upon. Too many prizes of very small amount appear to be given. An attempt should be made to enlist more sympathy on the part of the leading zamindars of the district in the development of the show.

Midnapur Agricultural Exhibition.—This exhibition was held at the Midnapur old Jail building from the 21st to the 28th of February last. Cattle, sheep, goats, pigs, poultry, &c, agricultural produce, agricultural implements, garden produce and manufactured articles were exhibited. Altogether, there were about 1,500 exhibits. Money prizes as well as medal were distributed. The expenses of the exhibition were met from subscriptions raised locally. The total expenditure under all heads amounted to Rs. 3,536, of which Rs. 1,074, were given away in prizes

Mr. D. N. Mookerji, Assistant Director of this Department, attended this exhibition and delivered two lectures, one on manures and one on insecticides. The working of the Hindustani plough and the iron *dons* of Birbhum for lifting water was demonstrated to the cultivators. Pamphlets published by this Department on the cultivation of potatoes, sugarcane, cotton, &c., were freely distributed among the raiyats and others who attended the *mela*.

The Sambalpur Exhibition.—An agricultural and industrial exhibition was held for the first time at Huma, Sambalpur, on the 23rd February 1906. As this was the first year of the exhibition, and the weather was very bad, the quality and number of the exhibits were poor. Rs. 351 were distributed in prizes. Government contributed Rs. 100 in aid of this exhibition. Mr. Liddell, Joint-Magistrate of Sambalpur, who was in charge of the exhibition, thinks that it is full of promise for the future.

The Jhenidah Agricultural Exhibition.—An agricultural exhibition was started at Jhenidah, a Sub-divisional head-quarters in the district of Jessore, on the 21st February 1906, with a view to improve the agriculture and industries of the Subdivision. Agricultural produce of different kinds was exhibited. Four gold medals and 13 silver medals and money prizes were awarded for the best exhibits. The working of the fly-shuttle loom was demonstrated, and the local weavers took great interest in it.

The Dumka Exhibition.—This show was held at the head-quarters station of the district of the Sonthal Parganas on the 25th January 1906. It is managed by a Committee with the Deputy Commissioner as President. Livestock, including cattle, sheep, and poultry, different kinds of agricultural produce of the district, works of local art and manufacture were exhibited. Rs. 481 were distributed in prizes to the successful exhibitors. The expenses were wholly met by private subscriptions.

The Bankura Agricultural and Industrial Exhibition.—The exhibition was opened on the 15th February 1906 by the Director of Agriculture, Bengal. In spite of bad weather the exhibition was well attended and the number of exhibits in the agricultural section was 1,250, and in the industrial section, 2,376. Besides the local exhibits, this Department sent a number of improved agricultural implements in charge of a Travelling Inspector who demonstrated their use. The *baktar* or sub-soil scarifier, the hand hoes and the iron *dons* for lifting water for irrigation were particularly appreciated by the raiyats.

Mr. D. N. Mookerji, Assistant Director of Agriculture, who was deputed to attend this exhibition, explained the use and value of different manures, laying emphasis on results obtained with paddy at the Burdwan experiment station. He also delivered addresses to the raiyats on the conservation of cattle manure, both solid and liquid, and on the use of green manuring. The cultivation of cassava and *buri* cotton in this district has been recommended. In the agricultural section improved agricultural implements, books on agriculture, medals, &c., were distributed as prizes. The expenses of the exhibition were largely met by public subscription. Government contributed Rs. 200 in aid of this exhibition. This is a new show, and great credit is due to Kumar Ramendra Krishna, the Collector of the district, for the manner in which he organised it.

Tintanga Mela and Agricultural Show.—An agricultural show is held in connection with a *mela* at Tintanga in the district of Bhagalpur, on the full moon day in the month of *Magh*. This fell on the 9th February this year. About 30,000 people gathered at the *mela*. Prizes were distributed in cash to the successful exhibitors. It is reported that the exhibition was on the whole a success. Mr. D. N. Mookerji, Assistant Director, attended this show and helped the Judging Committee.

Sitamarhi Cattle Show.—This cattle show was held on the 4th April 1906, during the *Ramnavami* fair at Sitamarhi in the district of Muzaffarpur. Rs. 100 from Provincial funds were paid in aid of this show, and a like sum and two silver medals were allotted out of the Imperial grant for special prizes. The animals exhibited, as in so many cases, were of poor quality. Captain Trydell, Superintendent of the Civil Veterinary Department, and Mr. Quinlan attended the fair.

Rajnagar Cattle Show.—This cattle show was held on the 29th January 1906 at Rajnagar in the district of Darbhanga. All the necessary arrangements for the fair were made on behalf of the Darbhanga Raj by the Sub-Manager, Rajnagar Circle. The number of exhibits was not actually greater than in the previous year, but they were of a somewhat better class. The *Sri Panchami* holiday was selected as the most suitable day for the fair, but the fact, that according to the local custom, this day is ceremoniously observed in connection with the breaking of young cattle to the plough, somewhat interfered with the success of the show. The date of the show has, therefore, been changed for next year. On the whole the show has advanced, but there is much room for improvement in the number and exhibits of all kinds. Rs. 200 were paid in aid of this exhibition from the Provincial grant.

The Kurseong Horse, Flower and Vegetable Show.—The second annual show was held on the 16th April 1906, and was an improvement on last year's show. Money prizes were given in all classes in which the Judges considered the exhibits were up to show standard. Rs. 540 were given in horse prizes, and Rs. 331 in flower and vegetable prizes. Captain Trydell, Superintendent, Civil Veterinary Department, attended and helped the Judging Committee. The show was principally supported by subscriptions raised locally, and Government contributed Rs. 200.

The Khulna Exhibition.—This exhibition was opened in the town of Khulna on the 28th February, and continued till the 7th March 1906. It included a cattle show and an exhibition of agricultural produce, and works of art and industry from the district. Various kinds of paddy and jute, 6 varieties of cotton, potatoes, sugarcanes and vegetables were exhibited. Improved agricultural implements and sericultural apparatus were shown by this Department. Mr. N. G. Mukherji, Assistant Director, and Babu Nibaran Chandra Choudhuri, Travelling Inspector, explained the use of the implements. Medals, money prizes and certificates were awarded to the successful exhibitors. Government contributed Rs. 200 in aid of this exhibition, which gives promise of development.

The Kalimpong Mela.—This *mela* was last held on the 22nd November 1905. Ponies, mules, donkeys, *siri* and other cattle, sheep, poultry, grains, roots, fruits and vegetables, dairy produce and works of local arts and industries were exhibited. The total number of entries in all branches was 1,288, and 347 prizes, to the value of Rs. 1,251, were distributed to the successful exhibitors. Captain Trydell, Superintendent of Civil Veterinary Department, who attended this *mela* and helped the Judging Committee, reported that there was a marked deterioration in the stamp of animals in almost all the classes, and unless there was a considerable improvement all round in the classes exhibited next year, he would recommend the withdrawal of the Imperial grant for special prizes at this *mela*. The Provincial grant-in-aid to this exhibition was Rs. 500, and the Imperial Grant for special prizes was Rs. 200.

The Angul Agricultural and Industrial Exhibition.—This exhibition was held at Angul on the 10th January 1906. The object of holding an annual exhibition in this part of Orissa is to improve the indigenous arts, industries and agriculture of the district of Angul, the Khandmahals and the Garhjat Mahals. The Native Chiefs take great interest in this exhibition, and send exhibits from their States. The exhibition was open for 3 days, and about 10,000 people visited it. The number of exhibits exceeded last year's number by

775. The following deserve special mention among the exhibits in the Industrial section. The ivory work of Bod, Talcher and Nyagarh, and the silk and cotton cloths of Baramba, Bod and Tigiria.

Several varieties of cotton seeds supplied by the Agricultural Department had been distributed by the Agricultural Association, and the cotton grown from them was exhibited and prizes were awarded. New varieties are said to have become popular.

Rs. 523 were granted in prizes. Government contributed a sum of Rs. 200 towards the expenses of the show.

APPENDIX VI.

Sirsia Research Station.

An account of the Scientific work on Indigo during the year 1905-06.

During the past year investigations into the cultivation and manufacture of indigo have proceeded along the lines foreshadowed in the last annual report. A full account of the work accomplished was published early in the year in the form of a report to the Bihar Planters' Association, which must be consulted for detailed information on the points which it is proposed to briefly summarise here.

Experiments in manufacture were carried out both at Sirsia and at Pusa. The main object held in view was the determination of the optimum combination of time of steeping and temperature of water under which to conduct the steeping process. Both Java and Sumatrana plant were used. The plan pursued was to steep in water at various temperatures for various periods and to determine the efficiency of the process carried out under each set of conditions by comparing the amount of indigotin actually obtained in the oxidising vat with the amount theoretically obtainable, as calculated from the weight of plant used and its analysis.

It was found that, with Java plant, the best results were obtained by using water at the temperature commonly holding in an indigo factory during the greater part of the manufacturing season about 90°F., and that the most advantageous period for which to steep at this temperature is 10 hours. With Sumatrana plant, slightly better results seemed to be obtained by steeping in water at 104° F. for 7 hours, but this conclusion is founded on an insufficiency of experiments and requires confirmation during the present season. The efficiency of the processes worked under these conditions is remarkably high, averaging 83 per cent., that is to say, 83 per cent. of the indigotin present in the plant put into the steeping vat is actually obtained in the oxidising vat. Having regard to the fact that at least 5 per cent. of the available indigotin is inevitably lost in the liquor soaked up in the refuse plant, there seems very little room for further improvement in yield at this stage of manufacture. It is also shown incidentally that the method of oxidising used (Rawson's ammonia gas process in conjunction with steam blowers) is as perfect in this respect as can be desired.

The quality of indigo produced at the higher temperature employed was slightly better than that obtained by working the processes affording the best yield of indigotin, but the difference is slight, and that obtained at the lower temperature is of as high a grade as the market demands, so that the improvement in quality does not justify the diminution in yield, especially considering the extra expense in working involved by employing water at high temperature.

It is strongly recommended, therefore, that the conditions of time and temperature mentioned above should be rigidly adhered to, and that means should be employed to raise the water to the necessary temperature when, as is frequently the case, at the beginning and at the end of the manufacturing season, and on wet or cold days, it naturally falls below the point desired.

The processes involved between the oxidising operation and the stage at which the indigo is finally obtained as the finished product are subject to a good deal of further improvement. A quantity of indigotin, amounting to about 10 per cent. of the total produced, is lost in the *seet* water run off the oxidising vat, and further losses occur in boiling, straining and pressing. These matters will receive attention during the present season. Experiments will also be undertaken on methods of drying indigo in powder form, a matter which we have not been able to take up hitherto.

The purely chemical work in the laboratory has continued throughout the year—a paper summarising the results obtained on the vexed question of indigo analysis will shortly be published, and it is hoped will set many of the disputed points at rest. Analysis of plant at various stages of growth, and under various methods of treatment, have been carried out and the study of the fermentation process has been extended. Latterly, attention has been paid to a consideration of the respective merits as dyes of natural and artificial indigo. Much work has been done on this question in the past, but the recent decision of the British Admiralty to institute comparative tests of the two substances, with a view to making use of the German product in naval contracts, if its merits should prove it of equal dying value, has re-awakened technical as well as political and financial interest in the matter.

Several agricultural experiments have been started during the year, and a few results have already been obtained. In the first place the superiority of the Java plant over the

old Sumatrana variety has been definitely established. The results obtained at Pusa showed that the former plant gave an increase of about 60 per cent. in yield of indigo over the latter, reckoning on the area cut in each case. This is however by no means as great an increase as has been obtained by many planters, since the Pusa results were complicated by the experiments in manufacture which were carried out with the plant. In several cases an increase of as much as 90 per cent. has been recorded, and this is in accordance with what the analysis of the plants indicate. The quality of the indigo made from Java plant is also found in most cases to be slightly superior to that made from Sumatrana by a similar process.

Several points have been dealt with in connection with the cultivation of the Java plant. It has recently been found that the difficulty attendant on the germination of the seed can be surmounted by treating it with sulphuric acid before sowing.

My notice was drawn to the possibility of this by Dr. Butler, Imperial Mycologist, who had found that treatment with this substance improved the germination capacity of cotton seed. In application to Java indigo the method has been very successful, both experimentally at Sirsia and in the hands of several planters who sowed in the spring of this year. Experiments at Pusa have proved that in growing the Java plants for manufacturing purposes, thinning is of no advantage but that, on the contrary, an unthinned crop gives the heaviest yield of plant. On the other hand, it has been shown that plant sown in October and November should invariably be cut back in the spring; in this way the number of stems is considerably multiplied and the leaf content is much higher when the plant is cut for manufacture than if the original stem is allowed to thicken and form wood. An attempt was made to manufacture from the cuttings removed in this way at Sirsia this year, but the results were not very satisfactory—partly due to the fact that cuttings had to be gathered from neighbouring factories, since the greater part of our own plant was not sufficiently advanced to cut, and the inevitable delay in collection led to a good deal of "burning" before the plant could be put into the vats, and partly because a very large excess of the yellow colouring matters peculiar to Java indigo was produced, due to the immaturity of the plant. It is doubtful whether it will even be advisable to attempt manufacture with these cuttings as a general practice. It may prove profitable to do so with the shoots obtained from second-year plant early in the year, since a greater bulk of these can be obtained from a smaller area, and it is an undoubted advantage to the plant to remove them.

In the manuring of indigo a series of experiments has been started at Sirsia having for their object the determination of the particular elements or compounds in the soil which are essential to the production of the glucoside. The experiments are being conducted in pits which have been entirely filled in with the same earth to avoid the disturbing effects of inequalities in natural soil and at the same time return the normal climatic conditions. They are thus of the nature of pot experiments, and no information will be derived from them as to yield. The plant grown is at present undergoing analysis for the first time, and will be analysed at intervals throughout its growth. Several pot experiments are also in progress.

The inoculation of indigo soil with a culture of the appropriate nodule bacteria, prepared according to Dr. Morris' method, has also received attention. The inoculated plots have not yet been cut, but judging by the eye no benefit whatever seems to have arisen from the treatment.

We have unfortunately not been able to make any progress with the all-important question of plant selection as applied to indigo. There is little doubt that there is scope for immense improvement in this direction, but it is essential that a trained botanist should take the matter up and devote all his time to it. A large series of varieties of indigo has been sown at Sirsia, and both these and the plants in the fields are now available for selection and hybridisation experiments, but at present there is no member of the staff competent to carry out the work. Considerable advance has been made in the matter of the cultivation of seed of both the Sumatrana and Java plants. The seed farm at Dasna is now being devoted entirely to the cultivation of the former variety since the climate of the North-West districts has proved unsuitable for the cultivation of Java seed. A sufficiently large area has been put down under the Sumatrana plants to provide the greater part of the seed which will be required for Bihar sowings next March, and since Mr. Flavell has kindly undertaken to supervise the cultivation and the whole has been started from good stock, considerable advantage should arise from the substitution of seed so produced for that purchased in open market. It is still a question whether Sumatrana seed cannot be grown satisfactorily in Bihar itself. Several planters kindly grew some seed for me last year, and it was partly sown here and partly distributed to other planters to be sown in March last. The germination was satisfactory and the crop is good; but it remains to be seen if the yield of indigo obtained from such plant is as good as that derived from plant grown from seed produced in the North-West, and, if so, whether the equality of merit can be kept up. The areas sown here are sufficiently large to provide enough plant for manufacture, and comparative trials of it and plant grown from North-West seed will be carried out during this season.

Several experiments in the cultivation of Java seed are at present in progress. The matters to which attention is being paid are (*i*) spacing, (*ii*) topping, (*iii*) cutting back (*a*) in the spring and (*b*) at the manufacturing season. Seed farms have been started at three places in Bihar, selected at points as far apart as possible. The area of each farm is

adjusted according to the requirements of the district from which it is geographically most remote and therefore best situated to supply, and it is hoped that sufficient seed will be produced to meet the large portion of the demand for sowings in October 1907. The plants on these farms have been thinned out to one and-a-half feet from plant to plant, and have not been cut back or topped or otherwise specially treated, but in future the practice will be guided by the results of the above-mentioned experiments.

C. BERGTHEIL,
Imperial Bacteriologist.

THE INDIGO RESEARCH STATION,
SIRSIA, MUZAFFARPUR.

APPENDIX VII.

Expenditure on Miscellaneous experiments and enquiries made by the Department.

	Rs.	A.	P.
Experiments other than those made in Experiment Stations—			
Seeds	11,656	15	8
Manures	4,312	15	9
Implements	2,377	3	9
Other charges	5,746	2	1
Total ...	24,093	5	3
Cost of deputation of Mr. N. G. Mukerjee to Kashmir and Bangalore on silk enquiries.	4,615	11	3
Cost of deputation of Mr. R. S. Finlow to Madras, etc., in connection with jute.	9,059	7	3
Cost of deputation of Mr. N. N. Banerji to United Provinces of Agra and Oudh, etc., for well irrigation enquiries.	3,940	13	2
Cost of deputation of Babu Hari Prasad Mitra to Central Provinces and Bombay to study cotton cultivation methods, cotton-ginning, etc.	110	0	0
Pay and travelling allowance of Travelling Inspectors ...	5,078	3	0
Total ...	22,804	2	8
GRAND TOTAL ...	46,897	7	11

APPENDIX VIII.

REPORT ON THE PRINCIPAL FUNGUS DISEASES OF CROPS IN BENGAL DURING 1905-06.

Wheat.—The late cold of the spring of 1905 checked what at one time threatened to prove a serious outbreak of rust in the western part of the province. The effects of this cold were, however, equally bad, and the yield must have been considerably diminished in certain districts. In the season 1906, moist warm weather in February led to an outbreak of rust in parts of Bihar, which was very severe in the neighbourhood of Pusa. Much of the grain did not set properly, and from some of the plots at Pusa the yield was very small. Smut was reported from Saran, but as usual was not sufficiently severe to repay seed treatment, only a few ears being affected.

Oats.—Smut is more prevalent in oats than in wheat, but the crop is not of considerable importance and the disease has not yet multiplied to such an extent that treatment is called for. It can easily be checked by soaking the seed in formaline or copper sulphate, at a small cost.

Paddy.—The disease known as *chatra* or *dakhina* in various parts of Bengal has been several times reported. It is of an obscure nature, but appears to be similar to the destructive disease known as *brusone* in Italy. In Italy and Japan the cause has in part been referred to a fungus *Sphœrella Malinverniana*, and the same fungus was found in most of the cases in Bengal. No treatment has as yet been suggested and further investigations are called for.

Sugarcane.—The "red rot" caused by *Colletotrichum falcatum* still continues to be a bar to successful sugarcane cultivation in many parts of Bihar, and is prevalent in most parts of the province where cane is grown. It has destroyed 80 per cent. of the estimated yield in some cases brought to my notice. Experiments have been in progress for several years past to determine the mode of spread, and it has been established beyond doubt that the chief method is through planting previously diseased canes. In the first year of infection the

fungus gains an entrance into the standing cane, probably largely through wounds or cracks in the rind. It spreads to some extent but apparently does not affect the stool but only the individual cane attacked. By planting out sets containing the fungus the succeeding year, the resulting stools become infected as a whole, and, if the season be favourable for the growth of the fungus, are entirely destroyed. In years unfavourable to the growth of the parasite there are indications that it may remain dormant, but as soon as a bad year for the cane comes, the parasite gets the upper hand and becomes capable of destroying the crop. There is no doubt that many races, particularly of the *pounda* or thick varieties of cane, have become thoroughly impregnated with the fungus, and the cases which have been reported of almost total destruction of crop have been shown to be due to the continued growth of cane varieties which have given indications from year to year that the fungus was gradually being multiplied in them. In certain races it is difficult to find a single cane completely free from the fungus. Since the presence of red rot is almost always indicated by the reddening of the pith, an effective method has been found of checking extension by discarding rigidly all sets for seed which show any indication of reddening at the cut ends. This has been established at Pusa as a perfectly feasible and effective method. At the same time it is all important to cease to grow those varieties whose previous history shows that they are specially susceptible to the disease. The method of seed selection against red rot is now practised on a number of estates in Bihar with generally good results.

A survey has been made of the other fungus diseases affecting cane in Bengal and an illustrated account is now in the press as a memoir of the Department of Agriculture in India.

A few instances arose of the importation of diseased cane from abroad. In one case the disease was one which is very destructive in Java and the West Indies but, so far, has not been discovered indigenously in Northern India. The consignment was destroyed before any harm was done. In other cases the canes are being kept isolated in nursery cultivation until their health is assured. This practice is to be recommended in the case of all cane imports for seed.

Tobacco.—The foreign Sumatra tobacco at Rangpur has been attacked both in 1905 and 1906 with mildew, caused by *Erysiphe cichoracearum*. As is the case with many mildews, it spreads chiefly in the plants grown under shade. The use of antiseptics, such as sulphur, on the leaves of a crop used as tobacco is, appears to be impracticable, but experiments are required to test whether the leaves could not be washed free from the sulphur before curing. A second leaf disease due to *Cercospora Raciborskii* is prevalent in Bihar and, while not capable of causing much damage ordinarily, would be most destructive to wrapper leaves.

Cotton.—Tree cottons have suffered from a root disease which is under investigation, but it appears clear that at least a portion of the damage, which was at first attributed to a fungus, is really caused by the cotton stem weevil, an insect mentioned in the account of cotton pests published by Mr. Maxwell-Lefroy in the Agricultural Journal of India, Volume I, Part I, 1906.

Rahar (*Pigeon pea*).—The wilt disease of this common pulse in Bihar does considerable damage. Its cause has been ascertained and a description of the fungus, its mode of action, and the possible methods of checking it, was published in the Agricultural Journal of India, Volume I, Part I, 1906. Experiments are in progress at Pusa and on some other Government farms in India in the hope of obtaining resistant varieties.

Opium poppy.—The opium poppy blight, due to *Peronospora arborescens*, was studied at Pusa this year, where it was severe. Information is still wanting as to the extent of the disease and the degree to which it will repay treatment.

Mango.—The mango orchards of Malda and its vicinity have been falling off in yield of late years. A local investigation of the cause was made by the Imperial Mycologist and the Assistant Director of Agriculture, Bengal, in August 1905. A very large proportion of the trees, chiefly grafts, were found to be infected by the parasitic alga, *Cephaleuros virescens*, well known as the cause of "red rust" in Assam tea. The parasite attacks the young wood, causing it to dry up and eventually killing it. Badly diseased trees have the greater part of the young, bearing, part of the branches destroyed, and the new growth takes place from the old woody stem, a "stag-headed" tree resulting, which bears little fruit. As the alga is common on mango trees elsewhere, without doing much damage, it is evident that there must be some local conditions which favour its action in this district. What these are was not ascertained, and no recommendations for treatment can be suggested without previous experimental work. Spraying is probably out of the question from the great size of the trees, but it is possible that judicious pruning and attention to manuring drainage and other methods of promoting root development would enable the trees to shake off the parasite. In the case of tea it has been clearly shown that "red rust" is a disease of weakly trees, and anything which tends to strengthen growth, checks the attack.

A number of other diseases of minor importance have been reported from time to time but do not call for any special remarks.

E J. Butler.

Pusa,
The 6th August 1906.

B. S. Press—18470 & 18493—550—15-9-1906—L. N

REVENUE DEPARTMENT.

AGRICULTURE.

DARJEELING, THE 31ST OCTOBER 1906.

LIBRARY OF THE BOMBAY BRANCH ROYAL

RESOLUTION—No. 3089T.—R.

READ—

The Report of the Department of Agriculture, Bengal, for the period of 15 months from 1st April 1905 to 30th June 1906.

Read again—

The Resolution on the Report of the Agricultural Branch of the Department of Land Records and Agriculture, Bengal, for the year ending 31st March 1905.

The last Report submitted on Agriculture was for the year ending 31st March 1905. To secure uniformity in regard to the period covered by the reports of the Provincial Agricultural Departments and the dates of their submission, and to make the reports available at the same time for the compilation of the general report of the Inspector-General of Agriculture, the Government of India, in their letter No. 6—231-1, dated the 8th March 1906, directed that the period covered by all reports of the Department of Agriculture should be the year ending the 30th June, and that the reports should be submitted by the Provincial Directors of Agriculture by the 15th September. The present Report, therefore, covers the period of 15 months from the 1st April 1905 to the 30th June 1906. It was submitted with commendable punctuality.

2. *Charge.*—The Department was in charge of Mr. N. D. Beatson Bell, as a branch of the Department of Land Records and Agriculture, till the 16th October 1905. On the 17th October 1905, Mr. C. E. A. W. Oldham was placed on special duty for the purpose of organising a separate Department of Agriculture. On receipt of the sanction of the Secretary of State to the appointment, Mr. Oldham was appointed to be the Director of the Department of Agriculture from the 3rd April 1906.

3. *Organisation of the Department.*—The lines on which the Department was to be organised were indicated in paragraph 3 of the Resolution of this Government on the Report for the year ending 31st March 1905. Mr. Oldham, after taking charge, prepared a detailed scheme for the development of the Department extending over ten years. The scheme is under the consideration of Government. A site for the Provincial Agricultural College has been selected at Sabaur near Bhagalpur; the lands required have been acquired; and plans of the necessary buildings have been prepared. Owing to a large increase in the number of applications for seeds and implements, the establishment of a seed and implement store became an urgent necessity. A godown near the office of the Director of Agriculture has been hired for the purpose; a stock of seeds and implements has been collected; and a Superintendent has been appointed to look after the store. Steps have also been taken to form two separate collections of implements, manures, and seeds to be sent round, in charge of competent officers, to fairs and agricultural and industrial shows, for exhibition and demonstration. The preparation of the weekly weather and crop statistics has been made over to the Department; and the preparation of all rainfall statistics has also been transferred to it from the office of the Meteorologist, Calcutta.

4. *Scientific Experiments.*—Experiments in the cultivation of jute were carried out on the lines indicated by the Inspector-General of Agriculture, land the results have been summarised in the Report. A note showing the work

done in connection with the selection of seeds is appended to the Report. Four special jute farms were established in Purnea, Berhampore, Krishnagar, and Chinsura; and work was conducted under the supervision of the Deputy Director. The proposed legislation to penalise the fraudulent watering of jute is still under consideration. About three-fourths of the area under jute cultivation is included in Eastern Bengal; and the Lieutenant-Governor awaits information as to the action which the Government of Eastern Bengal and Assam proposes to take in the matter.

It is to be regretted that the experiments made to introduce superior varieties of cotton again failed, the season being very wet even for Bengal. Attempts to improve indigenous varieties of cotton by seed selection are being continued; and a continuous record is being kept of the names of the raiyats, the character of the soil, the nature of the season, etc.

The results of the experimental cultivation of Muzaffarnagar wheat have not been encouraging on the whole, the unfavourable weather of the year being largely responsible for the failure. A scheme for future work in regard to Indian wheat has been framed by the Board of Agriculture. To give effect to the scheme in its entirety a wheat specialist will have to be appointed to control and guide the work of the Province. The question of the appointment of an expert is under the consideration of the Government of India. Meanwhile, Mr. N. N. Banerji has been deputed to make an agricultural survey of the different varieties of wheat.

5. *Irrigation Experiments.*—It has been decided to abandon the experiments, undertaken on the lines indicated by the Irrigation Commission, especially with regard to economy in the use of water, until it is possible to carry them out on a larger scale, and at more suitable sites, where an officer of some standing can supervise the work.

Last year, Mr. N. N. Banerji was placed on special duty in connection with well-irrigation. He visited the United Provinces, and made himself acquainted with the practice of irrigation from temporary wells, which have proved in famine years so valuable a resource in the eastern districts of those provinces; he then toured round the districts of the Patna, Bhagalpur, and Chota Nagpur Divisions in order to ascertain whether there are any insurmountable obstacles to the extension to those districts of the methods of well-irrigation which prevail in the United Provinces and to indicate localities in which the sinking of wells may be beneficial. He has completed his tour, and the report of the results of his enquiries is awaited. He has, meanwhile, submitted proposals regarding the training and maintenance of an expert well-boring staff whose services could be lent to landlords and cultivators. These proposals are now under consideration.

6. *Agricultural Stations.*—It has been decided by the Government of India that experimental farms should in future be designated agricultural stations. It has further been ordered that a separate annual report of each agricultural station, containing a continuous scientific record of experimental results, should be prepared; that an account of the administration of the station should be appended to the Annual Report of the Agricultural Department; and that, with a view to the dissemination of results when an experiment has become sufficiently advanced to yield definite conclusions, separate bulletins, containing an account of the experiments and the results achieved, should be published and widely distributed in the areas affected by the experiments in question. In view of these orders, a short account of the administration of the existing agricultural stations has been given in Appendix IV of the Report. The Lieutenant-Governor is glad to observe that considerable progress has been made at the stations, and that the Department is now in a position to make several definite recommendations as a result of the experiments carried out. A site for a new agricultural station for South Bihar has been selected near Bankipore, and steps have been taken for the acquisition of the land. The Director has also selected a site near Ranchi for a station for the upland tracts of Chota Nagpur.

7. *Experiments in Government and Wards' Estates.*—The Lieutenant-Governor notices with satisfaction that this important matter is receiving the special attention of the Director. It is hoped that with the appointment of an expert supervising staff and the issue of instructions as to the manner of

recording and reporting results of experiments, considerable improvement will be effected. The further report on this subject promised by the Director is awaited.

8. *Sericulture.*—The Bengal Silk Committee continued to do useful work. Owing to the transfer of certain important silk districts to Eastern Bengal and Assam, the Government contribution from this Province to the Committee has been reduced to Rs. 10,000 a year, with effect from the 1st April 1906.

The Lieutenant-Governor is glad to observe that the Tributary States of Mourbhanj, Keonjhar and Dhenkanal, are showing an enlightened policy in regard to sericultural and agricultural development.

In May last the principal firms interested in the silk industry submitted a strong representation, drawing attention to the marked decline in the industry in this province, and asking that prompt measures might be taken to re-establish it. A small Committee was, accordingly, appointed to enquire into the present state of the silk industry and the causes of the alleged decline, and to suggest remedial measures. The Committee have completed their work and their report is under consideration.

With a view to the improvement of the *tasar* silk industry, a farm has been opened at Chaibassa in the district of Singhbhum, and work has been started under the supervision of Mr. N. G. Mukharji.

9. *Agricultural Education.*—Seven out of nine students passed at the final examination from Sibpur. Two passed students have been selected to be sent to the United States of America, at the cost of Government, to study Agriculture at the Cornell University, Ithaca. Sir Andrew Fraser is glad to find that very satisfactory reports have been received of the progress made by the four students deputed to the University last year. The Director of Agriculture, Bengal, will be asked to convey to Mr. Bailey, the Director of the College, the thanks of the Lieutenant-Governor for the kind interest he is taking in the welfare of the students.

An agricultural class has been attached to the Hazaribagh Zilla School. Some improvement appears to have taken place in the attendance of students at the agricultural classes of the several schools and colleges; and useful work is reported to have been done in some places. It is hoped that the classes will attract more students and that attendance will become more regular when the Provincial Agricultural College is established, especially if scholarships are provided by District Boards.

The Lieutenant-Governor notices with satisfaction that the important question of the practical training of sons of cultivators is receiving the attention of the Director.

10. *Publication of Agricultural information, etc.*—It is to be regretted that the Director has not yet been able to arrange for the publication of an Agricultural magazine. His proposals as to the staff required for the work are awaited.

11. *Agricultural Associations.*—Divisional Agricultural Associations have been formed in all Divisions, except Bhagalpur, under the presidency in each case of the Divisional Commissioner. Divisional Agricultural Inspectors, selected from the passed students of the Sibpur Agricultural classes, have been attached to the Associations of the Burdwan, Presidency, Patna and Orissa Divisions to act as expert advisers on all questions that may come before the Associations, and to assist the members of local Associations in their work. Agricultural Associations have also been formed in almost every district. It is satisfactory to note that these associations have already done useful work.

12. *Indigo.*—The Lieutenant-Governor is glad to observe that very encouraging results have been obtained from the experiments made in the manufacture of indigo and the cultivation of Java-Natal seed.

13. The thanks of the Lieutenant-Governor are due to Mr. N. D. Beatson Bell for his management of the Department while it was under his charge, and to Mr. C. E. A. W. Oldham for the able manner in which he has discharged the duties of his new office and for the excellent and interesting report he has submitted. His Honour is glad to notice that Mr. F. Smith, Deputy Director, has been commended for his conspicuous zeal and for his close and careful supervision of the work done at the agricultural stations and jute farms under his charge; and he desires to acknowledge the services of

Messrs. D. N. Mukharji, N. N. Banerji and N. G. Mukharji. The thanks of the Lieutenant-Governor are also due to the Bengal Chamber of Commerce for the help courteously given by them to the Department. In conclusion, His Honour desires to place on record his appreciation of the constant assistance rendered to the Department by Dr. J. W. Leather, Imperial Agricultural Chemist, and of the valuable work performed by Mr. Bergtheil and his Assistants at the Research Station at Sirsia.

By order of the Lieutenant-Governor of Bengal,

R. W. CARLYLE,

Chief Secretary to the Govt. of Bengal.

No. 2935.

COPY, with a copy of the Report, forwarded to the Appointment Department of this Government for information.

No. 2936.

COPY, with a copy of the Report, forwarded to the Director of Public Instruction, Bengal, for information, in continuation of this office endorsement No. 3911 T.—R., dated the 9th October 1905.

No. 2937.

COPY, with a copy of the Report, forwarded to the Irrigation Department of this Government for information, with reference to paragraph 5 of the Resolution.

By order of the Lieutenant-Governor of Bengal,

M. C. McALPIN,

Under-Secy. to the Govt. of Bengal.

CALCUTTA,
REVENUE DEPT.,—*Agriculture*;
The 29th November 1906.

B. S. Press—29-11-1906—22999—570—T. N. R.

REPORT

OF THE

AGRICULTURAL DEPARTMENT,

BENGAL,

For the year ending 30th June 1907.

CALCUTTA:

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1907.

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[Maximum limit, 20 pages.]

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DEPARTMENT OF AGRICULTURE, BENGAL.

No. 5598A.

FROM C. E. A. W. OLDHAM, ESQ., I.C.S.,

Director of Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE,

LAND REVENUE DEPT.

Dated Calcutta, the 9th September 1907.

SIR,

I HAVE the honour to submit the Annual Report of this Department for the year 1906-07. Under the orders of the Government of India this report deals with the period of 12 months, commencing on the 1st of July 1906 and ending on the 30th of June last.

CHAPTER I.

ADMINISTRATION.

2. *Charge.*—I was in charge of the Department throughout the year. Mr. F. Smith, B.Sc., was Deputy Director of Agriculture throughout the year: as in the previous year, he was in direct charge of all the Departmental Agricultural Stations as well as of the special Jute Farms. Mr. H. H. Corbin, B.Sc., joined the Department during the year. It is proposed that he will assume the duties of Principal of the Provincial Agricultural College when it is ready. Since his arrival he has been making himself acquainted with the agricultural conditions of different parts of the Province, studying the work being carried on at the different Agricultural Stations, and learning the vernacular. Mr. D. N. Mukherji held the post of Personal Assistant from the 1st of July till the 4th of October 1906, when he went on three months' privilege leave. On the expiry of his leave he reverted to the general line. In March 1907 he was again attached to this Department on six months' special duty for the purpose of compiling an agricultural survey of the wheats and a classification of the soils of this Province. Mr. N. N. Banerji, who was on special duty during the first part of the year, relieved Mr. D. N. Mukherji as Personal Assistant, with effect from the 5th of October 1906, and has since continued to hold this appointment. Mr. N. G. Mukherji was on privilege leave from the 1st of May till the 31st of July 1906. On his return to duty he was placed on deputation to establish a Tasar Farm at Chaibassa. With effect from the 16th of September he was placed on special duty in connection with the Calcutta Industrial and Agricultural Exhibition, to collect and arrange exhibits on behalf of this Department. He was in charge of this Department's stall at the Exhibition when he was suddenly attacked by a severe form of paralysis, from which he died on the 20th of January 1907. Since the partition of the

Province there have been two Travelling Inspectors attached to the Department. One of these, Babu Nibaran Chandra Chowdhury, was on leave for seven months of the year. The other, Mr. S. A. Alim, whose time aws chiefly devoted to the supervision of cotton cultivation, died on the 7th of May 1907. His vacancy has not yet been filled, as I have not been able to obtain the services of a suitable officer for the duties required of a Travelling Inspector, although the post has been advertised in other Provinces as well as this. Babu Dhirendra Nath Pal, the Assistant Entomologist, was attached to the Department throughout the year. Babu Pramatha Nath Bhattacharji, one of the passed students of the Sibpur Agricultural classes, who underwent a course of training for 18 months under the Imperial Mycologist, joined the Department as a Mycological Assistant on the 11th April 1907. My head-quarters have continued to be at Calcutta. A suggestion has been made that the head-quarters of the Director should be at Bhagalpur. I have submitted a note to Government explaining why the Director's head-quarters should continue to be at Calcutta in the interests of the efficient administration of the Department.

3. *Organization of the Department.*—The 10 years' scheme for the development of the Department, submitted in February 1906, has been followed as far as practicable. Revised proposals for the creation of a Provincial and Subordinate Agricultural Service were prepared by me at the instance of the Revenue Department during the year. These proposals have been submitted to the Government of India. In accordance with the orders of Government, I drew up proposals for the employment of an expert staff of borers for making trial borings for wells in the districts of the Patna and Bhagalpur Divisions. These proposals were submitted with my letter No. 173T.A., dated 5th July 1906. The sanction of Government to these proposals was communicated with the Board's memorandum No. 238T.A., dated 4th May 1907, and a provision of Rs. 12,000 has been made in the current year's budget for the purpose. I have not yet been able to obtain the services of an officer qualified to train a staff of borers. The Public Works Department of this Government has expressed its inability to nominate any subordinate employed in that Department for the appointment. References made to the local Railway Companies and to the Engineering Colleges and advertisement in the leading papers have been equally unfruitful; and it is probable that an officer will have to be specially trained for the work. The Irrigation Department has been addressed in the matter.

4. Divisional Agricultural Associations have been formed now in all Divisions, except Bhagalpur. District Agricultural Associations have been formed in all districts but three. An itinerant Agricultural Inspector has been attached to each Division: the duties of these officers have been defined, and their relations with this Department, the local officers, the different associations and the members thereof have been laid down, and general instructions issued for their guidance.

5. In Government order No. 375, dated the 21st of January 1907, sanction was accorded to the appointment of a supernumerary officer, who is required to fill temporary vacancies occurring from time to time among the ranks of the Superintendents of Agricultural Stations, the Travelling Inspectors and the itinerant Divisional Agricultural Inspectors. An officer has been appointed to this post.

6. The laying out and stocking of the new Agricultural Station at Bankipore was continued. It was found that the allotment in last year's budget was not sufficient for the acquisition of the whole area originally proposed to be taken up. A portion was therefore released, and possession taken of some 210 acres. This area was completely fenced in, the necessary roads constructed, an irrigation channel made from the canal distributary that passes through the farm land, the Superintendent's quarters, cattle sheds, manure pits and temporary labourers' quarters were erected, and the farm fully stocked with bullocks during the year. The experimental area is now being laid out in uniform plots; and a masonry silo, a godown, hay shed and quarters for overseer-fieldmen are being constructed. At Sabaur possession was received during the year of the site, and much progress was made in clearing by the removal of the houses

of the *bastis* that fell within the area, the cutting down of trees, levelling of banks, etc. The erection of cattle sheds, Superintendent's quarters, temporary quarters for labourers and the model cattle byre that was exhibited at the Calcutta Industrial and Agricultural Exhibition was completed during the year, and the farm was fully stocked with bullocks. The construction of a masonry silo, of manure pits and of a hay shed was started, and these are now nearing completion. The whole area of 340 acres required for the College and Experiment Station was completely fenced in, and a large portion of the experimental area was cultivated. A contribution of Rs. 10,000 was paid to the Bhagalpur District Board towards the cost of constructing a metalled road to connect with Bhagalpur. Several groves of mango trees (both of seedlings and grafts) stood on the acquired area. Those containing the most valuable grafts have been allowed to remain, with a view to experimental work on mango cultivation, which is of special importance in the districts of the Bhagalpur and Patna Divisions.

7. During the year steps were taken to select a suitable site for an Agricultural Experiment Station for the upland tracts of the Chota Nagpur Division, but the Deputy Director of Agriculture did not approve of any of the sites hitherto proposed near Ranchi. Under the orders of Government, he visited the several stations in the Central Provinces with a view to ascertaining the conditions prevailing at the Agricultural Stations there; and I await his final proposals. Meanwhile, in order that the provision in the budget for the establishment of a new Agricultural Station might not lapse, I decided to take up an area near Chinsura, which Mr. Smith and I had selected to form an Agricultural Station for the deltaic alluvium. Steps were, therefore, taken for the acquisition of this site, and an area of a little over 200 acres has, since the expiry of the year under report, been taken into possession.

8. At the close of the previous year an area of over 50 acres had been acquired near Chaibassa for the establishment of a Tasar Farm, to give effect to the suggestions made by the late Mr. N. G. Mukherji in his report on the state of the Tasar Silk Industry submitted in 1905. During the year the necessary buildings were constructed on this farm, viz., the Superintendent's quarters, labourers' quarters, godown and cattle shed, and *asan* seedlings were planted. A large portion of the area was also cultivated with crops, such as cotton, maize, *juwâr* and groundnuts.

9. Four special jute farms were maintained under the Provincial Agricultural Association, which will be referred to below. A small area of about 5 acres was also taken on lease near Chakradharpur for special work in connection with the improvement, by plant-selection, of *Buri* cotton.

10. The organization of the Central Seed Store in Calcutta was completed during the year. An improved form of indent, showing the approximate cost of the different kinds of seeds and manures and the latest date for receipt of indent in each case, as well as a form of report on experiments in English and in the vernaculars were drawn up and distributed.

11. Measures were taken to place the Department in closer touch with all Agricultural shows and exhibitions held in the Province. The proposed dates for such shows were ascertained from the District Officers, and a list thereof printed and circulated to enable the Managing Committees to arrange as far as possible that one show might not interfere with another, and so that some officer of this Department might attend each. Two separate collections of approved implements, manures and seeds were made and two officers appointed and trained to demonstrate their uses.

12. The task of supervising the teaching in the agricultural classes at selected *zila* and high schools was taken over by this Department during the year at the instance of the Director of Public Instruction, Bengal.

13. Special attention was given to the publication and distribution of agricultural literature, and general and special lists for the distribution of different kinds of publications, such as reports, leaflets in English and in the vernacular, etc., have been drawn out to expedite work in this branch.

14. *Tours.*—I was on tour for 121 days during the year. In July and in August I toured with the members of the special Silk Committee

appointed by Government to enquire into the condition of the silk industry in this Province in the districts of Murshidabad, Birbhum and Midnapore. In the course of my tours I paid four visits to Bankipore Agricultural Station, three visits to the Sabaur Agricultural Station, three visits to the Cuttack Agricultural Station, two visits to the Dumraon Agricultural Station, two visits to the Burdwan Agricultural Station, and two to the proposed station at Chinsurah. I visited the Chaibassa Tasar Farm twice, the Sirsiah Research Station twice, and the special cotton cultivation at Chakradharpur and Jamtara four times. I attended the shows at Sonepur, Bankipore, Sripur and Suri. I paid two visits to the Research Institute at Pusa and one visit to Fraserganj. In the course of my tours I met the members of as many of the Divisional and District Agricultural Associations as possible. I also visited the Dumraon, Burdwan and Cuttack schools in connection with the teaching in the agricultural classes.

15. The Deputy Director frequently visited all the Agricultural Stations under his charge, as well as the special jute farms established by the Provincial Agricultural Association and the special cotton farm at Chakradharpur. He visited the Sonepur Fair, and there, with the help of Mr. Chardon and the Superintendent of the Civil Veterinary Department, selected and purchased about 150 head of bullocks for our new Agricultural Stations. I may mention here that all these bullocks have turned out excellently. Mr. Smith also visited several Agricultural shows. Mr. Corbin visited all the Agricultural Stations under the Department, and accompanied me in several of my tours with a view to learning local agricultural conditions. Mr. N. N. Banerji attended the Balasore Agricultural Exhibition. The special Overseers of the Department attended the other Agricultural shows.

16. *Miscellaneous work.*—A great deal of miscellaneous work had to be done during the past year. In the first place, the revision of the Manual of Rules for the preparation of Crop Reports and Agricultaral Statistics had to be taken up with a view to bringing it up to date, and adapting it to the altered conditions of the Department. Under the orders of Government it fell to me to prepare a Manual of Arboriculture for the Province: this was completed, approved by Government, and issued during the year. I prepared a scheme for the training of District Board Overseers and Sub-Overseers in Arboriculture at the Royal Botanic Gardens at Sibpur: these proposals were approved in Government Circular No. 7L.S.-G., dated the 29th of January 1907, and arrangements have been made with the Superintendent of the Garden and the Principal of the Civil Engineering College to conduct classes every year during the months of September and October. At the instance of the Director of Public Instruction, I prepared a simple syllabus for the teaching of agriculture in the higher classes at certain selected *zila* and collegiate schools, with a view to the preparation by competent persons of a suitable text-book for such teaching, laying special importance on the necessity of so writing the text-book as to lead pupils to observe and reason for themselves, and to set forth the subject in the simplest language and treat it in the natural order of sequence. In July, August and September my time was largely taken up as President of the special Committee appointed by Government to enquire into the state of the Silk Industry and the causes of its decline, and to suggest remedial measures. I submitted the report of the Committee in September 1906. The recommendations of the Committee were very briefly these;—that the number of model nurseries for the supply of pure seed, after examination according to the Pasteur system, should be very largely increased at an early date; that rearers should be encouraged to lease such nurseries or construct them; that microscopes should be supplied on the hire-purchase system; that steps be taken to encourage the planting of mulberry and establish a special mulberry farm; and that a thorough and sustained experiment should be carried out towards the improvement of the three most important varieties of worms used in the Province. The Government of Eastern Bengal and Assam were addressed on the subject with a view to their joining in the proposed measures. That Government has decided to work independently of this province, and I have since

submitted a draft scheme to give effect to the recommendations of the Committee in so far as the districts of this province only are concerned.

17. During the year a list of the Principal Economic Plants grown in Bengal, with their botanical names, English names and names in Bengali, Hindi and Uriya, was issued for the use of District and Sub-Divisional Officers and the members of local Agricultural Associations. I was appointed to be a member of the Executive Committee of the Industrial and Agricultural Exhibition held at Calcutta, and a good deal of time was also occupied in supervising the collection of sets of exhibits under certain heads on behalf of this Department. A descriptive list of all the exhibits prepared by the late Mr. N. G. Mukerji, who was in immediate charge of the stall, has been printed and published, and it remains as a record of Mr. Mukerji's wide knowledge and of his zealous interest in the subject. The Director is Chairman of the Committee of Management of the Bengal Veterinary College. The most important work that came before this Committee during the year was in connection with the laying out and improvement of the Institution.

The third Annual meeting of the Board of Agriculture in India was held at Cawnpore from the 18th to the 23rd of February. I was unfortunately laid up at the time and unable to attend, but Messrs. F. Smith and H. H. Corbin attended the Conference.

18. The Annual Season and Crop Report for 1906-1907 was prepared and submitted on the 10th of June, and the Annual Statistics of Crops and Area were also prepared. The usual Preliminary and Final Forecasts of the various staple crops, the Weekly Weather and Crop Reports, the Fortnightly Reports of Wholesale and Retail Prices-current, and the annual table of the average wholesale prices were issued.

19. The work in connection with the tabulation of rainfall statistics and the preparation of rainfall charts was transferred from the Meteorological to this Department with effect from the 1st July 1906, and the numerous statements and charts were issued in due course.

20. Towards the end of the year, I was entrusted by Government with an enquiry into the causes of the present high prices of food-grains in the Province. A note on this subject was submitted last month.

CHAPTER II.

Special Enquiry and Experiment.

21. *Aman paddy.*—The experimental work carried out in respect of *aman* paddy at the Burdwan, Dumraon, and Cuttack stations has demonstrated certain facts of special interest. The results at all three stations have shown that the most economical application of cowdung is about 50 maunds per acre, or in other words that not more should be applied than will supply about 17 lbs. of nitrogen per acre. The experiments at Burdwan have shown also that it is more economical to apply 3 maunds of bonemeal per acre than 6 maunds, and that the addition of 30 seers of saltpetre repays its cost many times over. Experiments at Burdwan and Cuttack have shown that transplanting one seedling per hole gives better results than transplanting two or more seedlings per hole, demonstrating that the ordinary practice of planting several seedlings in a hole is wasteful. It has been estimated that more than 35 million maunds of paddy are used every year in this Province for seed purposes only, so that a very large saving of grain for food purposes might be effected. Experiments conducted now continuously for 16 years at Burdwan with a variety of manures have shewn that an application of 3 maunds bonemeal and 30 seers of saltpetre gives the largest outturn both in grain and straw. As mentioned in last year's Report a quantity of these manures was distributed in 1906 to *raiyats* of the Burdwan Raj through the Dewan. The manure was applied during the year under report by 19 *raiyats* in different parts of the Burdwan, Hooghly, and Birbhum districts. The results in each case have been reported, showing the outturn where 1 maund of bonemeal and 10 seers of saltpetre were applied per *bigha*, as compared with the outturn in adjacent plots where cowdung or mustard-cake was used and where no manure was used. The results show that the average outturn of paddy per acre obtained by the use of bonemeal and

saltpetre was 40·2 maunds, as compared with 36·0 maunds where cowdung was applied, 37·2 maunds where mustard-cake was applied, and 19·5 maunds where no manure was given. Taking the value of the paddy to be Rs. 2-12 per maund, the value of the outturn per acre in grain alone averaged Rs. 111 in the case of bonemeal and saltpetre, Rs. 102 in the case of mustard-cake, Rs. 99 in the case of cowdung, and Rs. 54 where no manure was applied. Taking the cost of bonemeal and saltpetre to be about Rs. 12 per acre, the net increase in the value of grain produced by the use of these manures was Rs. 45 per acre, as compared with the unmanured plots. These results fully corroborate those of previous years. I have this year distributed in all some 870 maunds of these manures with the kind assistance of the Dewan of the Burdwan Raj and of Rai Bahadur Lalit Mohan Singh Raya of Chakdighi, Burdwan; and a Travelling Inspector of the Department was deputed at sowing time to instruct the cultivators in the use of the manures, and to see that they were actually applied, and to measure the plots. He will again be deputed at the time of ripening and harvesting, with a view to obtaining reliable reports on the results.

22. *Cultivation of Jute.*—The experiments with jute on the lines indicated by the Inspector-General of Agriculture were continued at the Burdwan Agricultural Station. Forty-seven varieties of *capsularis* and nine varieties of *olitorius* were grown. In the manurial experiments, cowdung again gave the best results, but the difference between it and castor-cake was not so marked as in the previous years. The experiments on cutting at different stages showed that the longer the crop was allowed to grow the heavier was the yield of fibre, and that there was very little difference in the quality of the fibre from the plants cut at different stages of growth. The most striking feature of the variety experiment was the continued superiority of (1) the Deswal farm-grown seed, (2) Baran of Mymensingh, (3) Amonia of Faridpur, and (4) Kakya Bombai of Sirajganj among the *capsularis* varieties. Among the *olitorius* varieties, the (1) Halbilati of Tippera, (2) Nailta of Mymensingh, (3) Tosha of Pabna, and (4) Deonalya of Dacca gave the largest outturn. The results in the spacing experiments tended on the whole to corroborate those of previous years, *viz.*, that thinning out the plants to 4 inches apart is the most economic practice. The experiment comparing the effects of sowing thinly and thickly for seed tended to show that thin sowing, or a little more air and sun-shine, produces better seed. For two years now experiments have been conducted at this station in growing jute in rotation with paddy on the same land in the same year. This practice has long been known to cultivators in certain of the jute-growing districts, but before specifically recommending it, the Deputy Director has made a careful personal experiment for two years. In 1905 a yield of 16 maunds of jute and $15\frac{7}{10}$ths maunds of paddy was obtained. In 1906, $17\frac{3}{5}$ths maunds of jute and an average of $17\frac{2}{5}$ths maunds of paddy was obtained. Deducting the cost of cultivation (which at the Government farms is necessarily heavy) and taking the current market rate for the produce, the net profit per acre was over Rs. 150. During the past year a similar experiment has been conducted at the Cuttack Station, and the results were practically the same. The results of these experiments are of the utmost importance to the cultivators in jute-growing districts. It has frequently been asserted that the rapid extension of jute cultivation jeopardises the food-supply of the people. Statistics of the areas under these two crops, respectively, during the past ten years demonstrate that there is no ground for such an assertion. However, these experiments show that even if the area under jute should enormously increase, the supply of rice need not necessarily be endangered, for the raiyat can take a crop of jute off the land, and at the same time grow his paddy as before. The results at the two experiment stations have been embodied by the Deputy Director in a special leaflet which has been printed off in large numbers in the vernaculars and distributed throughout the jute-growing areas of this Province. At the Cuttack station, experiments in the cultivation of jute have now being carried on for two years with very encouraging results, and there can be little doubt that an impetus has been given to the cultivation of this crop in Orissa where the area under jute has expanded much

in the last two years. The students deputed to this farm from different districts of the Division will carry back with them a knowledge of the best methods of cultivation, of manuring and of retting and of the best varieties.

23. The work begun in 1905 under the auspices of the Provincial Agricultural Association to obtain a better class of jute-seed by growing jute specially for the production of seed was continued during the past year. Four selected areas were leased at Purneah, Berhampore, Krishnagar and Chinsura with an aggregate of 100 acres. A special Overseer was put in charge of each farm, as it was found that it was wholly impracticable for one Overseer to look after two or more farms. These four special jute farms were carefully supervised by the Deputy Director of Agriculture, and, on the whole, the results were satisfactory, some 268 maunds of first rate seed having been obtained for distribution in the Province. The experience of the past two years, however, has clearly shown that it is a mistake having so many of these farms as four; that it is better for the purposes of control and supervision that only two should be maintained in suitable localities; and that if good work is to be done we must not have to depend on hiring bullocks, ploughs and labourers from time to time. For the current jute season, arrangements were accordingly made to maintain only two farms—(1) at Purneah and (2) at Berhampur, to purchase ploughs and bullocks, and erect the necessary sheds at each. Adding to the seed obtained from these special farms that produced at the Burdwan and Cuttack Stations, some 300 maunds of good seed were stocked in the Departmental Seed Store; and such was the demand for it from applicants in different parts of the Province that it was all disposed of by the end of February. At the Purnea Farm the Deputy Director received much assistance from Mr. Gwatkin Williams of the neighbouring factory: the thanks of the Department are due to this gentlemen. It was formerly the general opinion that jute would never thrive in the climate of Bihar. The depression in indigo of late years has led many planters to try other crops, and in 1906 several tried jute. A précis of the reports received by this Department on the results is given in Appendix I. The results gave reason for thinking that the cultivation of this crop would extend in North Bihar. Such has been the case, and during the current season the district returns show that 3,500 acres have been grown in the Muzaffarpur district and 5,000 acres in the Champaran district.

24. *Cotton Cultivation.*—Many varieties of cotton have been tried from time to time in this Province, including a large number of exotic varieties—American, Egyptian and Sea Island—but the results have in most cases been very unsatisfactory. Enquiries made in 1905-06 led me to the conclusion that if anything was to be done towards improving the cultivation of cotton in Bengal it would be best to work upon indigenous or already acclimatized varieties. The cotton locally known in Singhbhum and some adjoining districts as *Buri kapas* appeared on the whole to give the best promise of success. This cotton belongs to the species *Gossypium hirsutum*, and is of American origin, though the history of its introduction into this Province cannot be properly traced. Two compact areas were selected for the operations—one in the neighbourhood of Chakradharpur in the Singhbhum district, and the other around Jamtara in the Sonthal Parganas. These localities were selected for the following reasons:—The local conditions were suited to the growth of cotton; the cultivators had been accustomed to grow cotton themselves; the agricultural conditions were similar to those of places where it was known that this variety of cotton had already been grown; and finally the sites were convenient for the purpose of inspection and supervision of the cultivation. A travelling Inspector of the Department was placed in special charge of the work. Seed was distributed to about 40 cultivators near Chakradharpur and to about 47 cultivators in the neighbourhood of Jamtara, and money advances were given to them on certain conditions. At the Chakradharpur centre the seed was sown between the 29th of May and the 16th of June 1906, and at the Jamtara centre between the 15th and 29th June. The leaf-roller attacked the plants near Chakradharpur and the red cotton bug appeared

in numbers at both centres. In both areas the cotton did very well and produced a far better crop both in quantity and quality than the cultivators had seen before. Samples of the lint were sent for appraisement to two firms in Calcutta, and they valued it at between Rs. 35 and Rs 36 a maund. A large quantity of seed cotton from the Chakradharpur centre was sent to the Ramdyal Cotton Mills, Goosery, where it was ginned and spun into yarn. Some of the lint was first spun into 50*s* yarn, when it stood a test of 22lbs. per lea. Some was spun still finer into 80*s* yarn, giving an average test of 17lbs. per lea. The Manager spun nearly 6 maunds of lint into yarn and reported the result to be most satisfactory. Samples were also sent to other mills with somewhat similar results. A sample of the cotton were sent to the Imperial Instituite, London. The report of the Director shows that the lint was fairly soft, of good lustre and of normal strength; that the average length of fibre was 1·2 inches and the average diameter ·00075. The fibres were regular in diameter throughout. The commercial value of the lint was given as about 6*d.* per lb., or equal to "middling" American and fine machine ginned Broach. This is very much higher than the value of the ordinary Bengal cottons. In consequence of the satisfactory result of this experiment, arrangement has been made to start a small special farm of 5 acres near Chakradharpur, where an attempt will be made to improve on the stock by plant to plant selection, and where certain experiments will also be conducted to ascertain the best manure for the cotton plant under the local conditions. At first, at all events, the work will be confined to the *Buri* variety. A special leaflet was issued in 1906, with a view to discourage if possible useless experiments with exotic varieties and recommending only the *Buri* and Dharwar acclimatized American varieties.

25. Over 24 maunds of *Buri Kapas* and 2½ maunds of Dharwar acclimatized seed was distributed from the Departmental Seed Store during the year. Special measures have been taken to try and spread the cultivation of the *Buri* variety among the cotton cultivators of the Saran and Palamau districts. A sample of another good variety of indigenous cotton known as *Lambua* was also sent to the Imperial Institute, but the report received showed that the fibre was of very uneven length and strength, and inferior to the *Buri* variety. Some Caravonica cotton was sown at the Cuttack Agricultural Station, where it grew fairly well. Probably Orissa is the most suitable part of this Province to try this variety. Some more seed was obtained during the year, with special instructions regarding its cultivation, for trial at Cuttack.

26. An attempt to improve indigenous varieties in some of the Bihar Districts by selection and distribution of seed was continued, but the results have hitherto been so unsatisfactory, owing partly to the inferiority of the local varieties and partly to the impossibility, with the inadequate staff at my disposal, of supervising such operations over large areas, that I propose to give up this work, for the present at all events.

27. *Cultivation of Central Provinces Fine Aus Paddy.*—Towards the end of 1905-06, as mentioned in my last Annual Report, some 15 or 16 maunds of this seed were obtained from the Central Provinces for distribution in the districts of the Chota Nagpur Division. There was much delay in obtaining the seed and then, owing to want of railway communication, there was further delay in the consigments reaching their several destinations. A Travelling Inspector was specially deputed to watch the cultivation; but his report shows that the results have been very inconclusive. The best results were obtained by the Mission at Gobindpur in the Ranchi District, by Mr. Burton, Rai B. L. Singh and Mr. Clair Smith in the Manbhum District, and by Mr. C. K. Majumdar in the Murshidabad District. In these cases from 21 to 25 maunds of grain were obtained per acre, in spite of unfavourable conditions. But in almost all cases of failure there was a specific reason to account for it; and the Inspector reported that the majority of the cultivators themselves were hopeful of success. In Manbhum, Ranchi, Palamau and Singbhum the crops were largely damaged by insect pests, and in Hazaribagh by drought. The Inspector has recommended, as a result of

his experience, that the sowings be made much earlier than usual and that the seed be broad-casted, instead of transplanting. When an Agricultural Station is established for the Chota Nagpur Division, these matters will receive consideration. Many applications were received for this variety of paddy during the past year, and a considerable quantity has again been distributed.

28. *Cultivation of Ikri Sugarcane in Shahabad.*—A very interesting experiment was made during the past year at Jagdispur in the Shahabad District. Since the construction of the Sone canals in this District there has been a large increase of wet cultivation. It had for long been the practice in the district to rotate sugarcane with paddy in certain plots, but of late years the cane has much deteriorated, owing no doubt to the effect of the canals in raising the water level. The variety of cane ordinarily cultivated is the *mango*, which gives a high proportion of sugar, and the *gur* of which is very popular in this and the neighbouring districts. There is a consensus of opinion, however, that this variety is rapidly deteriorating in the canal-irrigated tracts. Mr. E. Mylne of Bihia, recognising the necessity for obtaining a variety of cane that would suit the altered conditions, applied to this Department. In the beginning of 1906 I procured for him about 2,000 cutting of the *Ikri* variety from the Faridpur District where it is reputed to stand considerable water-logging. Mr. Mylne planted these cuttings on 14 *kathas* of his own *zirat* land, one of the most lowlying portions being selected with a view to ensuring water-logging conditions. On the 5th of November 1906 I visited Jagdispur with Mr. Mylne, and saw the standing crop of *ikri* cane, which was much superior to anything in the neighbourhood, and was perfectly healthy. The field was then under water. On the 25th of December equal quantities of this cane and of the local *mango* variety were cut and crushed, and the outturn of *gur* from the *ikri* cane was found to be just double of the outturn from the local variety. It must be mentioned, however, that while the *ikri* variety matures rather early, the *mango* variety is not ordinarily pressed before the end of January or beginning of February. The result, however, was so highly satisfactory and the local cane cultivators who saw the crop were so anxious to obtain cuttings, that Mr. Mylne decided to keep the whole of the balance of the crop for seed purposes. In January of the current year I obtained a fresh supply of about 15,000 cuttings of *ikri* cane from the Faridpur district: with this and the crop of last year Mr. Mylne has been able to have 15 local bighas grown with this variety during the current year. An interesting fact in connection with last year's experiment was that this cane was not attacked to any considerable extent by pests, whereas adjoining plots of local varieties were badly attacked. This experiment is one of considerable interest, as it is an important problem to obtain a variety of cane that will thrive in wet areas, and can be rotated with *aman* paddy.

29. *Cultivation of Flax.*—During the year the Government of India imported a quantity of Russian flax seed for trial in this country. The seed was consigned to my address for distribution. The largest quantities were taken by some of the planters in Tirhoot, where flax machinery had been set up at two factories. Government made a grant to the Bihar Indigo Planters' Association to assist them in procuring the services of an expert to instruct the planters interested in flax in the most approved methods of preparing and marketing the fibre. The Association secured the services of a Belgian expert, who arrived in Bihar in March last, and has since then been studying the local conditions and giving instruction. He has kindly prepared a preliminary report on the results of his experience so far; though the views expressed are liable to modification after further experience, it was desirable that they should be made known to all persons in Bihar who might contemplate taking up the cultivation of flax. They have therefore been printed and circulated. The season of 1906-07 was not a favourable one for flax, and except in the cases of those who had had some previous experience of the cultivation, the results of the trials with the Russian seed, so far as reports have been received in this office, were generally unsatisfactory. About 4½

acres were cultivated with this seed at the new Agricultural Experiment Station at Bankipore. The outturn was 60 maunds of green plant per acre, and a large proportion of the plants stood between 3 and 4 feet high. I sent two bundles of the straw to the Imperial Institute, London, for examination and valuation. The report shows that the flax was longer and coarser than the standard sample of Belgian flax used for comparison; that the straw was well grown, but that probably the seed had not been sown thickly enough as a considerable amount of wood had developed in parts of the straw; and that with greater care in cultivation it is highly probable that flax of excellent quality could be grown in this locality. Further information on the subject of flax will be found in Appendix III.

30. *Cultivation of groundnuts.*—During the last two years experiments have been conducted with this crop at the Cuttack Station, where the soil is favourable for its growth. The results were satisfactory and have attracted the attention of many persons in the Orissa Division as well as of members of local Agricultural Associations in other parts of the Province. During the year some 45½ maunds of groundnuts were distributed from the Central Seed Store. A special leaflet was prepared by the Deputy Director, explaining the methods of cultivation.

31. *Cultivation of Mangel Wurzel.*—A supply of good mangel wurzel seed was imported in 1906 from Messrs. Sutton, and distributed to selected correspondents in different parts of the Province, to ascertain how it would do under varying conditions of soil and climate. Twelve correspondents submitted detailed reports of the results, which in each case was either satisfactory or very good. The Superintendent of the Hazaribagh Reformatory School, by dint of careful cultivation, obtained an outturn at the rate of upwards of 32 tons, with a value of Rs. 437 per acre. Professor Dutta of the Sibpur College also obtained some promising results. The roots grew well at Khulna, Patna and Muzuffarpur, at Fraserganj in the 24-Parganas, and in the Hooghly, Bankura, Gaya and Balasore districts. The cultivation of these roots has been carried on in some of the Bengal Jails for the last 16 or 17 years. One of the chief advantages of the crop is that it can be sown till about the end of February, so that roots may be obtained all through the hot weather and the early part of the rains, when vegetables and fodder are generally scarce.

32. *Agricultural Stations.*—Under present orders a short account of the administration of each station is given in an appendix (*vide* Appendix IV). The Annual Report of each station containing a scientific record of the experimental results is being prepared by the Deputy Director of Agriculture, and will be issued separately as usual. In paragraph 6 above, a short account has been given of the progress made in the establishment of new agricultural Stations. We have now got large agricultural stations at Bankipore and Sabaur, and land is under acquisition for another near Chinsura. We have an Agricultural Experiment Station also at Cuttack of about 44 acres. It is proposed to enlarge this area, so as to form a large Agricultural Station for the Orissa alluvial tracts. It is proposed to establish another large Station in the Ranchi district to represent the peculiar agricultural conditions of the Chota Nagpur uplands. A sixth station on the lateritic area, which is characteristic of large tracts in the Midnapore, Bankura, Birbhum and other districts will complete the requirements in respect of such stations for many years to come. Until the large stations are thoroughly equipped and in working order, it is proposed to maintain the Dumraon and Burdwan Stations as at present.

33. The Board of Management of the Kalimpong Homes having obtained the services of a qualified agriculturist for the institution, the opportunity has been taken by Government of making a grant towards the establishment of a small special farm at Kalimpong for the cultivation of hill crops, and where special attention will be devoted to the cultivation of fruit trees.

34. It was decided during the year to abandon experimental cultivation at the Sripur farm on the Hathwa Estates. This Department is now only concerned with the cattle-breeding operations being carried on there.

CHAPTER III.

Agricultural Experiments in Government, Wards' and Private Estates.

35. There is not much to be noted under this head this year. The seasons were generally unfavourable. Drought in some places and floods in others damaged the *bhadvi* and *aghani* crops. Much injury was also done to the *rabi* crops by insufficient moisture during early growth and cloudy weather, rain and hail at ripening and harvesting time.

36. *Potatoes.*—In the majority of cases the outturn is said to have been unsatisfactory. There were, however, a few cases of success. The Naini Tal variety was cultivated successfully in the Hindol estate in Orissa. At Khulna the Patna variety was very successfully cultivated, as in the previous year, by the Manager of the Syedpur Trust Estate. The Collector informs me that the cultivation of this crop is now spreading in his district. The same variety was also successfully grown at Angul and by Babu Jotindra Nath Bose of Jamalpur in the 24-Parganas.

37. *Wheat.*—The Muzaffarnagar variety of wheat was cultivated in several places. The results were generally unsatisfactory owing to the unfavourable weather conditions. There is a general complaint in Bihar that this variety is more liable to rust than the local kinds. The Department is refraining at present from recommending its cultivation generally. It will probably be one of the items of work to be undertaken at either the Bankipore or the Sabaur Agricultural Station, to try and produce an improved and hardy variety of wheat.

38. *Cotton.*—About 13 maunds of cotton seed of the *Buri* and Dharwar acclimatized American varieties were distributed in the year 1905-06 to various parts of the Province. In many cases the results have been very satisfactory. In the Bankura District, Babu Raja Ram Mitra obtained an outturn of 15 maunds per acre of lint with seed from the *Buri* variety and $7\frac{1}{2}$ maunds from the Dharwar American. The Deputy Commissioner of Angul writes of the *Buri* cotton: "This variety is very fine, has bigger bolls and more lint than the local kind. It is recommended for cultivation in a larger area." This variety has also done very well in Calcutta, at Khulna, at Neora in the Patna District, and in the Hooghly, Nadia, Monghyr and Balasore districts. Several correspondents reported that the cotton had not done well; I have personally inspected during my tours several of the fields in these cases, and have invariably found that the want of success was entirely due to neglect of the instructions issued in a leaflet sent out with the seed. In some cases the ground on which the cotton had been grown was wholly unsuited to this cultivation; in some the plants were choked with weeds, and in others the ground was water-logged, and no attempt had been made to drain it. Babu Shama Podo Ghosh at Madipura in north Bhagalpur was very successful with some Dharwar American, which he thinks is well suited to that part of the country. This variety also did well in several of the Native States in Orissa.

39. *Central Provinces Aus paddy.*—This variety did not do well in the Palamau District, the outturn being said to be less than that of the local varieties. It is reported from the Khulna District, however, that seed was distributed among 20 tenants of the Syedpur Trust Estate, with satisfactory results.

40. *Other Crops.*—On the Fraserganj Government Estate, Mr. D. Sunder successfully cultivated a variety of vegetables, including tomatoes beet, carrots, radishes, melons, cabbages and onions. Mr. Sunder has also been most successful in the cultivation of cocoanut trees and pineapples. With the approval of Government, I have arranged to take up an area of 50 acres on this island with a view to the cultivation of market garden crops and some varieties of fruit trees. *Swati* paddy was grown successfully at the Hazaribagh Reformatory School. Groundnuts were cultivated with success in the Khurda estate in Puri, in the Bhadrak subdivision of Balasore and in the Bankura district. The reports from Government and Wards' Estates are, on the whole, unsatisfactory, and indicate generally a want of supervision over the experiments. Now that an itinerant

Agricultural Inspector has been appointed to each Division, I trust that their services will he fully utilised by the District Officers in advising as to the crops to be grown and in supervising the work.

CHAPTER IV.

Agricultural Education.

41. *Agricultural classes at Sibpur.*—There were 10 students, of whom five were general and five special, in the second-year class, and 12 students (six general and six special) in the first-year class on the 1st of July 1906. At the annual examination held in November 1906, 10 students obtained diplomas and 11 students were promoted from the first to the second-year class. There are now 13 students in the first-year class, of whom 10 come from Bengal and three from Eastern Bengal and Assam. Of the 10 students who obtained diplomas in November last, the first in order of merit obtained an appointment as a Deputy Collector, and the second was appointed to be a Sub-Deputy Collector. Three of the others have obtained appointments in this Department, and two have been deputed for a further course of training to the Cornell University in America. The remaining three were offered appointments as Fieldmen-Overseers at an agricultural station, but they have declined to accept these appointments. In view of the establishment of a Provincial Agricultural College near Bhagalpur, the agricultural classes at Sibpur will be closed after November 1908: there will be no further admissions to these classes during the current year.

42. *Agricultural classes attached to Ravenshaw College and Collegiate School, Cuttack.*—Admission to these agricultural classes is limited to the students of the 1st and 2nd classes of the Collegiate School and of the 1st and 2nd-year classes of the College. The course extends over 2 years; and the students are taken to the Agricultural Experiment Station on Saturdays to receive practical instruction at the hands of the Superintendent. There were 40 students on the roll on the 31st of March 1907, as compared with 42 in 1906. The students of these classes have hitherto made little or no progress, and many of them seem to join the classes simply for the sake of being driven out on Saturdays to see the farm. The Director of Public Instruction has sanctioned a proposal made by the Principal that the students of the second-year class who pass the annual examination should be awarded a certificate. It will be very necessary to arrange that the examination shall be a proper test.

43. *Agricultural classes at the Gaya Zilla School.*—Agriculture is taught at this school in all the classes, except the highest and the lowest. The theoretical lectures were attended by 148 boys and the practical classes by 117. The attendance was fair until January 1907, when it fell off in consequence of a severe outbreak of plague in the town. The theoretical classes were held in the school-rooms, and the practical classes in the school garden after school hours. The garden was divided into plots, and five boys told off to cultivate each plot, each getting his share of the crop according to the work done by him.

44. *Agricultural classes in the Dumraon High School.*—Agriculture is taught at this school in the 2nd, 3rd, 4th, 5th and 6th classes. The total number of boys attending the lectures was 124. It is reported that the boys do practical work in the special garden attached to the school for one hour every afternoon; the teacher also takes them occasionally to the local Agricultural Experiment Station, and explains the various experiments being carried on there.

45. *Agricultural classes in the Hazaribagh Zilla School.*—The classes started in this school were placed under the instruction of the Farm Overseer of the Hazaribagh Reformatory School, who is given a monthly allowance of Rs. 10 for this extra work. The average attendance in the 1st-year class was 11, and in the 2nd-year class, 12. The arrangement by which the Farm Overseer does the double duty, *i.e.*, at the farm and at the school, has not proved a success.

46. *Agricultural classes at the Burdwan Municipal School.*—The agricultural classes opened at this school were divided into four sections, the total number

of students being 37. Theoretical lessons were given at the school, illustrating, where possible, from nature; and for practical demonstration the boys were taken to the Departmental Agricultural Station about three miles away.

47. At the request of the Director of Public Instruction, Bengal, I prepared during the year a syllabus of agricultural teaching for use in these selected *zila* and high schools where agricultural classes are held. This syllabus, with general instructions as to the method of teaching to be adopted, was circulated to all the schools in the latter part of the year under report, and it is now being adopted. Hitherto the teaching in these classes has been much too theoretical. I found little boys being taught lists of names and percentages, technical terms they could not understand, and such subjects as the action of nitrifying bacteria! What is wanted in such agricultural classes is to train the boys to observe for themselves the facts of plant life and to reason for themselves, and not to make them learn technical terms, botanical names and statistical statements by rote. It is most difficult to make the present agricultural teachers understand this. They appear to have no conception of the principles that make for the education of the faculties of observing and reasoning. It is not sufficient in their case to prescribe a syllabus and formulate general instructions as to the method of teaching. Though specifically directed to illustrate each stage in their lectures by example from nature, I find from two inspections that I have made since these instructions issued, that the teachers are still proceeding in their faulty methods. It is evident nothing can be left to their discretion, and that their lectures must be practically written out for them, and the examples from nature to be used illustrated for them; and the sooner a text-book for this Province is drawn up on the lines already suggested, the better. Until this is done, these classes will do no real good. While the teachers are incompetent to teach, the pupils cannot be expected to acquire useful knowledge. It will be some years before teachers can be trained. The Provincial Agricultural College will assist in this direction; but meanwhile we should I think, endeavour in some of the schools where agricultural classes are now held, to train a number of boys in correct methods of observation and reasoning, to give them such an education in the fundamental principles of plant life and growth as will enable them when they grow older to impart instruction on correct lines to a younger generation. There are these and other matters in connection with these agricultural classes that will need consideration at the hands of the educational authorities, and in respect of which I am in communication with the Director of Public Instruction.

48. At the small Seri-Agricultural School at Sabang in the Midnapore district a few crops, such as Central Provinces *aus* paddy, groundnut and cotton, were grown. Some Mysore silk-worms were reared during the year with considerable success. I have come to the conclusion that this school would do better to confine its attention to sericultural work.

49. *Deputation of Students for agricultural training in America.*—The four students who were deputed by this Goverument to the Agricultural College at the Cornell University in the United States have, it appears from the reports received, made good progress in their studies, and one of their number has obtained a high distinction. The two students who were sent out to the same College in 1906 are also reported to be getting on well. The sanction of the Government ot India has very recently been received to send two more students during the current year: they started on the 28th ultimo. This Department is greatly indebted to Mr. L. H. Bailey, Director of the Agricultural College, for the personal interest he has taken in the welfare and progress of the Indian students that have been sent. The four students who were deputed in 1905 are expected back towards the end of the current calendar year. This Government has agreed to allow one of them to take employment under the Government of Eastern Bengal and Assam. The remaining three will, as soon as they return, be offered appointments in this Department.

50. *Deputation of Students to the Pusa Institute.*—Of the two students sent to Pusa last year for training under the Imperial expert staff, Babu Promotho Nath Bhattacharjya, who took up Mycology as his special subject of study, was favourably reported on at the end of his course,

and has been appointed to act as Mycological Assistant in this Department. The other student, who took up Agricultural Chemistry, did not prove a success, and I have been unable in consequence to offer him a similar appointment.

51. *Practical training of the sons of cultivators.*—Of the five students who were accommodated in the previous year at the Cuttack Agricultural Station for practical training, one left and five new students joined the farm during the past year. The students were housed in the cooly-lines which were burnt down in March last, and they have had to leave the farm till new accommodation is provided. One of the most promising students, of two years standing, has been appointed a fieldman at the Sabaur Agricultural Station, as a reward for the work done by him and as an encouragement to others. Hitherto the only station at which accommodation was available for students who desired to undergo a course of practical instruction was Cuttack. It is proposed to provide suitable accommodation at the new large agricultural stations for students specially deputed by local bodies or private zamindars, or for men of the cultivating classes who may be drafted to the stations to learn by actual practice the methods of cultivation followed there.

CHAPTER V.

Publication of Agricultural Information and Supply of Seeds, Manures, and Implements.

52. Considerable progress was made during the year in the preparation and distribution of agricultural literature. The following 13 leaflets were prepared during the 12 months under report:—

(1) A short note on cotton for the use of cultivators.
(2) Instructions for the destruction of insects attacking jute.
(3) Short note on potato cultivation for cultivators.
(4) Teaching of the experimental work at the Burdwan Station.
(5) Teaching of experimental work on paddy and potatoes at the Burdwan Station.
(6) A simple method of destroying the red cotton bug.
(7) Note on the jute experiments at Cuttack.
(8) Note on the jute experiments at Burdwan.
(9) Jute in rotation with paddy in the same year.
(10) Note on groundnut cultivation.
(11) Potatoes at Burdwan.
(12) Potatoes in rotation with jute.
(13) Variety experiment with mustard at the Dumraon Station.

All of the above, except two which were not appropriate for the purpose, were translated into the three vernaculars, Bengali, Hindi, and Uriya, and distributed in large numbers in the districts concerned.

53. Besides these leaflets, some notes on agricultural topics received from other parts of India were reprinted and circulated. A note on the cultivation of the mango in Bihar by Shams ul Uluma Syed Imdad Imam was circulated in the Bihar districts. Copies of all Farm Reports and other publications of the Department were also distributed to the Local Agricultural Associations.

54. A list of the principal economic plants grown in Bengal with their English, vernacular and botanical names, a Report on the Sugarcane Industry of Bengal, by Mr. N. N. Banerji, a Report on the Possibility of Extending Well Irrigation in Bihar and Chota Nagpur, by Mr. N. N. Banerji, and a catalogue of the exhibits of this Department at the Calcutta Industrial and Agricultural Exhibition, by Mr. N. G. Mukherji, were published and distributed during the year. A revised Bulletin on Agave and Furcraea in India by Messrs. Drummond and Prain was also issued.

55. At the instance of Government, arrangements were made during the year for the issue of a Quarterly Journal by the Department. This Journal is intended primarily for the members of the several local Agricultural Associations and for such members of the landholding and farming classes as take a personal interest in agricultural matters. The first number of this Journal has been issued since the close of the year.

56. *Supply of seeds, manures, and implements.*—The work at the Departmental Seed Store increased to such an extent that the accommodation in the godown in Pollock Street was found to be scarcely sufficient. At each of the new agricultural stations a large iron godown has been constructed. It is proposed that hereafter, when these stations are in full working order, approved seed produced on the farms will be stored there for distribution, thus forming a seed store at each station; but some years must necessarily elapse before this can be arranged on a thoroughly sound basis. During the year some 1,114 maunds of seeds of various kinds and 1,186 maunds of manures, besides cuttings of sugarcane and cassava, were distributed by the Department. Of seeds, the heaviest issues were of jute, Russian flax and *buri* cotton; and of manures, bonemeal and saltpetre. The supply of seed potatoes and sugarcane cuttings was purposely reduced owing to the difficulty experienced in the previous year in sending any large quantities of these to distant places. In the case of potatoes, arrangement has been made with dealers to supply applicants direct.

CHAPTER VI.

Agricultural Associations and Agricultural Shows.

57. *Provincial Agricultural Association.*—The special jute farms maintained by this Association have already been referred to in paragraph 23 above. A full account of the work done and the cost incurred will be found in Appendix II. Among others matters that came before the Association were the questions, what kind of work should be done by the members of Local Agricultural Associations, and what kinds of seeds should be stocked and distributed by the Department. The first question was referred to a special Sub-Committee who drew up proposals. The decisions arrived at were incorporated in the instructions issued with my Circular No. 251-A., dated the 13th of October 1906. The decisions on the second question were included in my Circular No. 239A., dated the 3rd of October 1906. The Association also decided that the work on the *buri* variety of cotton should be continued at Chakradharpur. The question of referring applicants for seed to local dealers and firms direct was fully considered; and it was decided that until a more reliable class of dealers arose, it was impossible to recommend this course as a hard and fast rule.

A large number of books were added to the Library during the year.

58. *Divisional and District Agricultural Associations.*—Detailed instructions were issued during the year for the guidance of members of these Associations, indicating the kinds of demonstration and other work that might suitably be undertaken by them, the precautions as to site, conditions, methods, etc., to be taken in such work, the way to apply different kinds of manure, and the necessity of maintaining and submitting a record of all such work, for the information and guidance of others. Circular instructions were also issued regarding the submission of indents for seeds, with a list of the kinds that would be supplied, giving the earliest dates for sowing, the seed rate per acre, the latest date for indenting, etc. These instructions have not, I regret to say, always been complied with. Itinerant Agricultural Inspectors were appointed during the year for the Presidency, Bhagalpur and Chota Nagpur Divisions. Each Division has now been supplied with such an officer. Full instructions as to the nature of the duties to be performed by these Inspectors were drawn up by me, and have been circulated with the approval of Government. It is essential that their services should be utilized in every way possible, and I have in the course of my tours made a point of explaining this to the local Associations. The fortnightly diaries submitted by each Inspector show that three of them are doing some useful work already, while one is not likely to be of much use. They are all young men who have passed through the Sibpur Agricultural classes, and it will take some years, perhaps, of practical training in their work before they become fully efficient in the duties required of them. It is quite possible that some may prove unsuited for these itinerant duties, in which case they will have to be weeded out. An allotment of Rs. 1,000 was made to each Commissioner for distribution among the Associations in his Division, according to their merits and requirements.

59. Of the Divisional Associations, those of Patna and Orissa did the best work during the year. In respect of work done by the District Associations the following cases are specially mentioned. Rai Bahadur Lalit Mohan Singh Raya, a member of the Burdwan District Association, has been taking a lively interest in agricultural development, and is engaged in some very useful work. Mr. W. Val Weston of the Birbhum Association made some interesting trials with Central Provinces fine *aus* paddy, which tended to show its superiority over the local *aus* varieties. The Bankura Association made great progress during the year: they have managed to erect a very suitable building, with a room for their meetings and a library and a store room for seeds and implements. Babu Raja Ram Mitra and Babu Puran Chandra Pal, members of this Association, did interesting and successful work with paddies, cotton, and groundnuts. In Hooghly Mr. B. K. Mitter has been taking much interest in agricultural work and has made some suitable trials with potatoes, groundnut, and cotton. Babu Tarak Nath Banerji and Rai Bahadur Kali Charan Ghosh of the 24-Parganas Association have during the year carried out some valuable trials with potatoes and jute: these gentlemen have shown that they take a real interest in the subject. In Khulna, Babu Troylakha Nath Chatterjee of Ghatbhog and Babu Jatindra Nath Bose, Manager of the Syepur Trust Estate, have been specially commended. Both these gentlemen have done useful work. Mr. E. Mylne of Bihia in Shahabad has been engaged during the year with an important experiment, already referred to in paragraph 28 above. Babu Hari Har Prosad Singh of Dumraon demonstrated that jute can be cultivated and rotated with paddy in the same year in this district; and Babu Hari Narayan Singh of Shahpurpatti and Chaudhuri Karamat Hossain of Arrah have taken an interest in the work of the Department. In Gaya, Mr. A. C. Wright of Deo and Mr. Solano of Arwal have shown most interest. Dr. Shamapada Ghosh, Mahashay Tarak Nath Ghose, and Babu Siva Shankar Sahai, members of the Bhagalpur District Association, have shown a keen interest in the work. In Monghyr, Rai Kamaleshri Prosad Singh Bahadur, Chaudhuri Azirul Haq, and Babu Preo Nath Banerji have already done some useful work. In Cuttack the Subdivisional Officers of Jajpur and Kendrapara have been specially mentioned; in Balasore Raja Bahadur Baikantha Nath De is showing the keenest interest; and in Puri, Babu Harish Chandra Ghosh. In the Chota Nagpur Division useful work has been done by several members of the Ranchi Association, among whom Babu Saroda Kumar Aikat and the Revd. Father Grosjean may be mentioned. This Association is giving an impetus to the cultivation of potatoes in the district. In Hazaribagh the best work has been done at the Reformatory School.

60. *Agricultural and Industrial Shows and Fairs.*—In Appendix V a brief account has been given of each of the local fairs and exhibitions held during the year. These were encouraged as far as possible by this Department. Grants-in-aid to the aggregate of Rs. 6,600 were made to the Managing Committees. Two collections of implements, seeds, and manures were made, and a special staff of two Travelling Overseers entertained to demonstrate their working and uses and to distribute leaflets, the shows being divided between the two officers. The Itinerant Divisional Agricultural Inspectors also assisted in most cases in the organization of the agricultural side of the shows, and in a few cases the Deputy Director, Assistant Director or I attended.

61. Such shows must play an important part in the dissemination of a knowledge of new and improved implements, appliances, and methods among the agricultural and industrial classes, and for this reason it is desirable to foster their growth and promote their activities. It is, I think, highly gratifying to note that as a result of the action taken, no less than ten new shows were inaugurated during the year, and that out of 33 districts in the Province such shows were held in 21. In many cases they were organized on a suitable plan and carried through with success; in other cases there was room for much improvement. So far as this Department is concerned, the chief importance of these fairs is that they serve as a means of spreading among the truly agricultural classes information in regard to the different implements used, crops grown, and methods followed in other parts of the country, suggesting improvements in their own tools and practice. It is very essential, therefore, that special measures should be adopted to attract the cultivating classes from the rural parts of the district to attend and to exhibit. With this object, the Managing Committee of the Bankura Exhibition very

wisely, I think, arranged last year to present as prizes in the agricultural section certain approved and handy implements and some useful books on agricultural subjects, and the Bhagalpur Association arranged for the presentation of seeds. It would be well if other Committees followed these examples. At several shows visited during the past two years, I have noticed that the money prizes given, although often very numerous, were of insufficient value (frequently Rs. 5, Rs. 3, Rs. 2 and Re. 1) to tempt the best cultivators to go to the expense and trouble of making, perhaps, a long journey and exhibiting their produce. It is, I venture to suggest, more appropriate to give a few substantial prizes for the best exhibits than a large number of prizes of very small value: the latter system will only attract the poorer cultivators from the immediate vicinity. I would like to see the standard of prizes much raised. For instance, for the best cultivation of sugarcane a good pattern mill might be given; for the best maize, an useful huller; for the best potatoes, a few *kudali* forks; for the best vegetables, a good box of Sutton's seeds, for the best fruit, say, a dozen grafts of the best varieties of mango, and so on—something of practical utility and of lasting value. The practice of giving only silver or bronze medals or certificates to ordinary cultivators should be discouraged.

62. There is another matter of the utmost importance to the success of these shows, and that is that their dates should be fixed well before hand, and the widest publicity given to the date, the classes of exhibits to be brought and the nature and value of the prizes to be awarded. Notices printed in the vernacular should be published as widely as possible, copies being sent to all Government officials, all zamindars of any standing, sarpanches or presidents of panchayats, police stations, out-posts, etc. A list has again been prepared in my office of all fairs and shows, with dates, to be held during the current year. Last year full advantage was not taken of the list, and the result was that the dates of several fairs coincided. It is not always possible to avoid this, but in some cases it is.

CHAPTER VII.

Miscellaneous.

63. *Crop cutting experiments.*—The returns of the crop cutting experiments carried out during the 5 years 1902-1903 to 1906-1907 are now being scrutinized and tabulated in my office for submission to Government. The total number of experiments accepted is 3,933, as compared with 3,194 in the previous quinquennium. The results differ widely in many cases from those of the previous 5 years, and are often difficult to reconcile: they are still far from satisfactory, I am afraid. The defects most frequently noticed are, that representative crops are sometimes not chosen; that the figures have not been properly checked; that the outturn of unirrigated crops is shown to be greater than from irrigated; that the area selected has been too small; and that the terms "husked" and "unhusked" have been confused.

64. *Entomology and Mycology.*—Flights of locusts appeared in all the districts of the Patna Division except Patna, and some damage was done by them in the Buxar, Siwan and Samastipur subdivisions and in the Sadr and Bettiah subdivisions of Champaran. Flights also visited parts of the Hooghly, Jessore, Bhagalpur, Purnea, Hazaribagh, Palamau and Monghyr districts. Injury is only reported to have been done to the *bhadvi* crops in Hazaribagh and to the *urid* crops in Purnea. Insect pests are reported to have damaged the *rabi* crops in Palamau and in the Buxar subdivision of Shahabad. The wheat crop was attacked by pests in the Darbhanga, Sadar and Somastipur subdivisions, and the gram and the poppy in the Sewan subdivision. In parts of Shahabad the sugarcane was attacked by a borer, while paddy and jute are of reported to have been damaged by insects in parts of the 24-Parganas and Howrah districts. Except in Palamau the damage done appears to have been slight.

65. The Entomological Assistant attached to the Department in the preceding year was, at the recommendation of the Imperial Entomologist, deputed to visit different parts of the Province to acquaint himself with the insect pests occurring, at the same time collecting and sending specimens to Mr. Lefroy at Pusa. During the year he investigated chiefly the pests of the jute, paddy,

sugarcane, cotton, and potato plants, working out their life history and identifying them where possible. It will be sometime before practical work can be attempted: still what he is doing now is useful preparation. The Mycological Assistant remained under training at Pusa till the second week of April 1907. Since then he has also been deputed to study diseases locally. For this purpose, he visited the districts of Shahabad, Patna, Bhagalpur and Khulna, with little result so far. His work is being watched by the Imperial Mycologist by means of diaries as in the case of the Entomological Assistant. When the full expert staff for the Provincial College is appointed, I trust it will be possible to utilise the services of these Assistants more to the advantage of this Province.

66. *Sericulture.*—The appointment of a special Committee to enquire into the condition of the Silk Industry in the Province has already been referred to in paragraph 16 above. The operations of the Bengal Silk Committee continued during the year to extend over the districts of Bogra, Malda, and Rajshahi in the Province of Eastern Bengal and Assam. That Government will now, it is understood, make arrangement to control all the sericultural operations in the new Province. The Committee started work in Bogra in 1901, and there has been a steady extension of mulberry cultivation since. Two private nurseries have been started, and some rearers have remodelled their rearing houses on improved plans. In Malda the area under mulberry increased considerably during the past year. The advantages of Pasteur's system are now appreciated by most of the rearers in this district; many have built new rearing houses according to the standard plan, and many have improved their houses by the substitution of wire-net doors and windows. Some 44 rearers have bought microscopes, and some 400 have learnt how to use them for the identification of disease. In Rajshahi also progress is reported, the two nurseries established having done good work.

67. In this Province, in Murshidabad district there are now 7 nurseries in working order; one was unfortunately destroyed by flood. From these large quantities of pure seed were distributed to the rearers, and the demand for this seed is now greater than the supply, and more nurseries are urgently wanted. Nothing could be more satisfactory than this. In Birbhum the rearers were hitherto slow in accepting Pasteur's system, but through the endeavours of Mr. A. K. Ghosh, the Sericultural Superintendent, and the personal example and encouragement of Mr. Val Weston of Ganatia, they have now adopted it and realize its advantages. The nursery at Rammati has worked at a profit, and large quantities of pure seed have been distributed. Mr. Weston has been of great assistance to the Committee, and his recent transfer to Sardah in the new Province will be felt as a loss. A very interesting experiment has been conducted during the past year by Mr. Ghose on the cold storage of *deshi* seed, with a view to delaying the cutting out and hatching of the worms and eggs, so as to be able to supply seed on different dates according to the requirements of the rearers. I am publishing a separate note on this subject in the Quarterly Journal of the Department. This Government contributed Rs. 10,000 during the year to the funds of the Committee, the work of which Mr. C. A. Dubus, as Secretary, continues to administer with his usual care and ability.

68. Sericulture continued to receive attention in the Morbhanj, Keonjhar and Dhenkanal States. In Morbhanj an experienced officer was appointed to conduct the operations. In Keonjhar the mulberry plantation was extended, and seven crops, yielding about 421 kahans of cocoons, were successfully reared. In Dhenkanal attention was paid to silk weaving.

69. The Tasar Farm at Chaibassa is now fully equipped with buildings, cattle and implements. Four-fifths of the area has been planted with *asan* trees, many of which however have been killed by white ants. The tasar cocoon experiments carried out so far were not successful, owing to insect pests and disease in the Larya and Bagui stock. The Muga worms promised well, but owing to incessant rain about the spinning time many of them died. According to the suggestion of the late Mr. N. G. Mukherji some Muga seed cocoons were given to several of the local zamindars for distribution to rearers. The results have not yet been reported.

70. *Indigo.*—This Government continued the grant of Rs. 50,000 for research work in indigo to the Bihar Indigo Planters' Association. The staff at the Research Station at Sirsiah consisted of Messrs. Bergtheil (Imperial

Bacteriologist on deputation) Briggs and McGregor. Mr. J. G. Turnbull joined as Botanist on the 26th March 1907. The staff have continued to do valuable work, which has met with the commendation of the Indigo Planters' Association. The Advisory Committee, which consists of four practical planters, the General Secretary of the Bihar Indigo Planters' Association and the officer in charge at Sirsiah, met once a month during the year, with very commendable regularity. The following reports and notes were published during the year:—

(1) Second note on the treatment of Java indigo seed with sulphuric acid to promote germination.
(2) Rough draft of the proposed indigo cess.
(3) Method of estimation of indigotin in commercial indigo.
(4) Suggestion of the Sirsiah Committee regarding utilising the proposed indigo cess.
(5) Report of the Indigo Research Station, Sirsiah, for the year 1906-1907.
(6) Second Annual Report of the Sirsiah Sub-Committee.
(7) Report on the results of the practical dye-test of natural against synthetic indigo.
(8) Note on Java seed farms.

Three special seed farms for the Java-Natal plant were maintained under the management of Messrs. C. R. McDonald, E. H. Hudson, and G. B. Hay, producing some 1,986 maunds of seed. The Sumatrana seed farm at Dasna in the United Provinces produced 2,462 maunds of seed. Two new bungalows for the staff, a dye house with vats and boilers, a powder-making machine, a filter press and some extra pumping machinery were constructed and set up during the year. The work already carried out at this station has given considerable encouragement to the cultivation of the Java-Natal plant, which continues to show its superiority; and from returns recently received it appears that nearly 37,000 *bighas* have been planted with this variety this year. It is satisfactory also to note that there was a general increase in the area sown with indigo in Bihar during the year. A short account of the scientific work carried out during the year will be found in Appendix VI. Mr. Bergtheil and his Assistants are to be congratulated on the work done; and I wish to bring to the special notice of Government the services of Mr. T. R. Filgate, General Secretary of the Bihar Indigo Planters' Association, for the able manner in which he has guided the work of the Sirsiah Committee, of which he is also Secretary.

71. *Tobacco cultivation.*—In the early part of the year under report, two representatives from the Peninsular Tobacco Company called upon me in connection with a proposal to start the manufacture of cigarettes in this Province. I gave them such information as was available in my office as to the best localities for tobacco cultivation; and as a result of the local enquiries made by them, the Company has commenced to construct a manufactory on a large scale near Monghyr, where the curing of leaf has already been begun. This industry should benefit the cultivators of tobacco in the Bihar districts.

72. *Sugar.*—Two *rab* making appliances (*bel*) were supplied to Mr. Percy Jones, of Benipore Factory, during the year, to work in connection with the cane-crushing mills previously supplied him. Mr. Jones reports that he has succeeded in making *rab* of uniform quality and superior to that ordinarily made in the district. For certain special reasons, there was but a small margin of profit. The experiments will be continued; they are of interest as an attempt to deal with small local areas of cane.

73. *Arboriculture.*—A Manual of Arboriculture has been published. The first report on the work done in accordance with the instructions contained therein will not be received till next year, when they will be noticed. The classes at Sibpur for the training of Overseers, Sub-Overseers and other subordinates of District Boards in arboriculture, in accordance with the proposals submitted in my letter No. 2818-A., dated the 17th of July 1906, were opened last month. The District Boards have been asked to make the necessary arrangements to depute at least one Overseer, Sub-Overseer or Road-sarkar from each district every year for the purpose of being trained in these classes.

74. *Poppy soils.*—At the request of the Opium Agent, Bihar, I arranged with the Imperial Agricultural Chemist to have analyses made of the soils

on which different classes of opium had been grown and of the water with which they had been irrigated, with a view to ascertain if possible the causes of the differences in yield of opium. The analyses made, however, did not exhibit any feature that could be regarded as accounting for the difference in yield.

75. *Emigration to Burma.*—In view of the fact that the Government of Burma has decided that there is no longer any need for Bihari labour in Burma, this Government has discontinued, with effect from the 1st of April last, the subsidy hitherto paid for the conveyance of emigrants. During the year 235 adults and 60 children were conveyed as State emigrants, as compared with 1,150 adults and 327 children in the previous year. The settlers are reported to be prospering.

76. *Agricultural Museums.*—No new museum was established during the year. The small collection at Dumraon continues in the same condition.

77. *Agricultural Implements.*—The usual list of implements tried in the Province during the year is given in Appendix VII. Several kinds of sugar cane mills, ploughs, drills, forks, hoes, sprayers and chaff-cutters have been tried during the year at the Agricultural Stations. These comparative trials will have to be continued for a longer period. A rice-husker kindly supplied by Messrs. Burn & Co. was tested at the Cuttack Agricultural Station. In all some 160 implements were sent out from the Departmental Seed Store, as compared with 44 in the preceding year.

78. *Officers of the Department, etc.*—The Deputy Director of Agriculture, Mr. F. Smith, B.Sc., has continued to work with the greatest zeal, exercising constant supervision over the several Agricultural Stations and the special farms under his charge. During the past two years the Agricultural Stations have, under his control, shown a most marked improvement in the standard of work done. He has also been of much assistance in advising on scientific points. My thanks are due to Mr. N. N. Banerji, Personal Assistant, for his cordial co-operation and devotion to his duties. It is with the utmost regret that I record the death, during the year, of Mr. N. G. Mukherjee, who was for many years so closely connected with this Department, and whose knowledge of sericulture as well as of the agriculture of the Province was probably unequalled. In the death of Mr. S. A. Alim, Travelling Inspector, the Department has lost the services of a zealous and useful officer. The Department is much indebted to Dr. J. W. Leather, Imperial Agricultural Chemist, for help rendered in making analyses of soils and manures.

I have the honour to be,

SIR,

Your most obedient servant,

C. A. OLDHAM,

Director of Agriculture, Bengal

APPENDICES.

APPENDIX I.

Cultivation of Jute in North Bihar during 1906.

Précis of reports received.

No.	Name of the Factory.	Area.	Outturn.	Remarks.
1	Dooriah Factory (Motipur P. O.)	...	...	The Manager states that there is no reason why jute should not be grown to a large extent in his district, if the cost price to the raiyat does not fall below Rs. 5 per maund for average stuff.
2	Dholi Concern (Muzaffarpur)	...	...	The Manager states: "I can only speak of it in the highest terms. Not only is it a profitable investment in £ *s. d.*, but it can be sown in lands, wet generally, which lie empty for six months in the year."
3	Moniarah Factory (Gopalganj-Saran).	8¾ bighas ...	107 maunds ...	The result was satisfactory, although the field was flooded, and the crop consequently secured late. Rupees 56 was the profit per bigha.
4	Ramkola (Saran) ...	25 bighas, out of which 3 bighas got swamped.	130 maunds of jute and 20 maunds of seed.	The Manager is of opinion that jute will do exceedingly well in Bihar. Sown in April.
5	Jumapur Factory (Sewan-Saran).	¼ acre ...	2½ maunds ...	The Manager states that where labour is scarce, as is the case in the neighbourhood of his factory, it is impossible to go in for the crop on a large scale.
6	Purtabpur Factory (Mairwa-Saran).	...	...	The Manager is of opinion that there is not sufficient land suitable for jute cultivation on any large scale in that part of Saran.
7	Sathi Factory (Champaran)	...	4 maunds 37 seers per bigha.	The Manager states that in another factory, where seed was sown earlier on irrigation, he obtained 28 maunds from 1½ bighas. The season was generally unfavourable. The industry ought to be a success.
8	Patahi (Champaran) ...	20 acres ...	5 maunds per acre on the average.	The jute sold for an average of Rs. 7-8 per maund. The cost of cultivation was Rs. 23-8 per acre, and the net profit Rs. 15 per acre. The seeds were sown as late as the end of May or beginning of June. If it were sown earlier the outturn per acre would, the Manager thinks, have been at least 10 maunds. The Manager is of opinion that as long as the present prices are got for jute, encouragement should be given to this industry.
9	Pudamkair (Champaran) ...	20 acres ...	...	A mistake was made in sowing too thin, but where the land was suitable; the return was very good and the quality was fair. The Manager is of opinion that jute will do well in Champaran.
10	Rajpur (Champaran) ...	...	...	The Manager is of opinion from extensive experiments made that the prospects of the jute industry in Bihar are exceedingly promising, and that the extension of cultivation simply depends on the amount of labour procurable.

No.	Name of the Factory.	Area.	Outturn.	Remarks.
11	Laheriah Factory (Bettiah)	4 acres ...	10 maunds per acre.	The season was very unfavourable. The Manager thinks that under favourable conditions, jute should grow well in this part of Bihar. But for want of sufficient labour, it cannot be undertaken on a large scale.
12	Barah (Champaran) ...	75 acres ...	5 maunds per acre.	Two-thirds of the crop were lost owing to the flood of August. The raiyats are eagerly going in for the crop, and it is a crop which the raiyats can work very well. The Manager thinks that Europeans can never themselves be large growers. It takes too much labour.
13	Byreah (Bettiah) ...	15 acres ...	Good ...	The Manager states that jute should not be grown exclusively on low-lands.
14	Pirakpur (Muzaffarpur) ...	10 bighas ...	47 maunds ...	Profit expected, Rs. 40 per bigha. Manager does not think concerns can go in for growing jute on a large scale as it requires so much labour to work it off.
15	Motipur (Ditto) ...	...	...	Mr. T. Barclay, Manager of Motipur Factory, states: "Jute has come to stay in Bihar, and will be a most useful adjunct to our yearly profits. We had a most trying season for jute, and it came top out of all other crops."
16	Bathnaha (Sitamarhi) Muzaffarpur.	...	...	The Manager reports that he tried a little jute which gave an excellent outturn. If prices keep up, jute in this part of Bihar would pay.
17	Kastoopur Factory (Muzaffarpur).	15 bighas ...	10 maunds per bigha.	Result most satisfactory. Had some trouble in retting as there were only a few men who knew how to work it.
18	Kurnowl Concern ...	...	...	The Managing owner states that he has been trying jute for the last three years. It grows well, and in his opinion it is likely to become a big industry, and it is a safe crop for Bihar.
19	Thikaha (Motipur) ...	...	...	The Manager reports that the raiyats grew jute which gave an outturn of 20 maunds of fibre per bigha on exceptionally good lands. From the experiments already made, he is of opinion that jute will grow very well in Bihar, but it cannot be undertaken by any Factory on a large scale owing to the enormous amount of labour required in the preparation of the fibre.
20	Bhagwanpur Concern (Tegra)	...	...	Jute was tried by the Manager on a small scale. It was damaged by the floods, but what was left gave a good return. With anything like the present prices it will be a very paying crop. It grows well in Bihar.

APPENDIX II.

Jute Seed Experiment in 1906.

(Being a note submitted at a meeting of the Provincial Agricultural Association in December 1906.)

The work that was begun in 1905, to obtain a better class of jute seed by growing plants specially to produce seed, has been continued this year.

In 1905, 12½ acres were devoted to this object, at four centres, viz.—Gouripur (Mymensingh), Rangpur, Jalpaiguri and Rajbari (Faridpur), under the charge of one Jute Overseer, with the result that 27¾ maunds of good seed were obtained.

In 1906, 99½ acres were taken over for the same object, viz.—30 acres at Purnea, 23 acres at Berhampore, 28 acres at Krishnagar, 18½ acres at Chinsura, and one Overseer was put in charge at each farm, with the result that a total of 268¼ maunds of jute seed have been obtained.

In the first place, seed was obtained in the best way we could from our farms and through the kindness of Messrs. Bird & Co., Messrs. Ralli Bros. and the Subdivisional Officer of Sirajganj. Interpreted, this means that our seed was the surplus of many small farmers' seed-supply, and hence could not be a uniform sample. This year we employed, as far as possible, our own grown seed of 1905, and made up the balance by a further supply of seed, as in 1905.

At Purnea, out of 30 acres sown, the table below gives full details of 21·2 acres. Of the remaining 8·8 acres, about 6 acres of splendid fibre crop that was in low-lying land was destroyed by flood, and the other 2·8 acres did not come to anything through being sown too late.

Three varieties, viz., Deswal of Serajganj, Kakya Bombai and Hewti of Rangpur (all *Corchorus Capsularis*) were grown, and the total yield of 130 maunds of seed, *i.e.* 6 maunds per acre, must be considered to be very satisfactory when the many difficulties that had to be contended with are taken into consideration. These difficulties are :—

A.—The farm has no plough bullocks of its own, and is entirely at the mercy of the local raiyats, who very naturally say: "Let us finish our own cultivation first, when we will do yours." Even then they don't forget to demand the highest price possible and to do a minimum of work. To remedy this, the following proposal is made: To purchase six pairs of bullocks for the farm and rent a part of the Bonbagh Factory for housing the same, or erect a cheap cattle-shed for the housing of the animals. Good animals should be forthcoming at an average of Rs. 100 per pair.

B.—There is no farm staff, with the exception of the Overseer, who again is more or less in the hands of the labourers, and these latter do their own cultivating first. To remedy this, the following proposal is made: To appoint a permanent staff of one man to every pair of bullocks on a salary of Rs. 6 per month, and a head cultivator on Rs. 8 per month in addition to the Overseer and one chaukidar. The want of bullock power at the right time prevented us from having the land ready at the critical moment for sowing, nor was the land prepared as well as one would have liked, and the scarcity of labour would not allow our thinning the crop out in time. A large area could not be thinned out at all. These difficulties will be more forcibly demonstrated by a glance at the figures at Berhampore and Krishnagar (see below).

The thanks of our Association are due to the great help given us in both cases at Purnea by Mr. Watkin Williams of the neighbouring factory.

Results at the Purnea Farm :—

Block.	Variety grown.	Source of seed sown.	Area in acres		Outturn of seeds in mds., etc.	Rate of yield per acre in mds., etc.	Remarks.
			Ordinary crop.	Thinned crop.			
1	2	3	4	5	6	7	8
A	Deswal, Serajganj (*C. Capsularis*).	Serajganj supply of seeds, 1905.	6·5	...	45 0 0	7 0 0	Plants with fair branching.
,,	Ditto ..	Dttio ...	...	0·5	4 23 4	9 6 8	Plants very branching and forming numerous pods.
B	Kakya Bombai Serajganj (*C Capsularis*).	Gauripur Farm grown, 1905.	5 1	...	15 32 0	3 4 0	
,,	Ditto ...	Ditto ...	...	0·5	1 30 0	3 10 0	
C	Deswal, Serajganj (*C. Capsularis*).	Bird & Co.'s supply of seed, 1905.	5·6	...	56 36 4	10 0 0	Plants thin and tall, and branching only at the tops.
,,	Ditto ...	Ditto ...	...	0·5	2 5 8	4 11 0	Ditto plants got too tall before thinning.
D	Hewti of Jalpaiguri (*C. Capsularis*).	Jalpaiguri Farm grown, 1905.	2·5	...	3 34 0	1 26 0	Crop much damaged by floods; plants stout and tall; very little branching or fruiting.
			19·7	1·5			
		Total ...	21·2				
		Total outturn of seed in mds., etc. ...			130 1 0		

At Berhampore, 23 acres were sown with the three following varieties, viz.—Deswal (*C. C.*), Hewti of Rungpur (*C. C.*) and Satnala of Faridpur (*C. C.*), but only about 8 acres produced a fair crop, the remaining 15 acres being a failure. This failure is attributed (1) to points A and B as mentioned above on the Purnea Farm, (2) to the incapacity of the Overseer who is not capable of performing more than Sub-Overseer's work, and (3) to the farm being surrounded by jungle and waste land where insects breed and thrive in large numbers. These insects did much damage. Only 15½ maunds of seed were obtained from this farm. The following table gives details:—

Variety grown.	Area in acre.	Outturn of seeds in maunds, seers, etc.	Rate of yield per acre in maunds, seers, etc.
Deswal of Serajganj (*C. C.*) ...	5	10 26 0	2 5 3·2
Hewti of Rungpur (*C. C.*) ...	2	3 23 0	1 31 8
Satnalla of Faridpore (*C. C.*) ...	1	1 14 0	1 14 0
Total ...	...	15 23 0	

At Krishnagar, 28 acres were taken over by us and sown with the three following varieties, viz.—Deswal (*C. C.*), Hewti of Rungpur (*C. C.*) and Amonia of Mymensingh 6 acres of the above, due to late sowing died off soon after coming up. Of the remaining 22 acres, only about 9 acres produced a good crop, the remaining area failing after the plants had grown up to about 1½ feet to 2 feet high. The failure is attributed chiefly to the want of our own bullocks and labour, and partly to the fact that half the area we were forced to take is not suitable for jute cultivation. The original area chosen by our Department was not allotted to us, and we had to take the present area or do without land at all. From the 9 acres, 43⅓ maunds of good seed have been obtained.

The following statement gives the yields of the different varieties at the Krishnagar Farm:—

Variety grown.	Area in acre.	Outturn of seed in maunds, seers, etc.	Rate of yield per acre in maunds, seers, etc.
Amonia of Mymensingh ...	4	15 17 0	3 34 4
Hewti of Rungpur (*C. C.*) ...	1	5 29 0	5 29 0
Deswal (*C. C.*)	4	22 13 0	5 23 4
Total ...	...	43 19 0	

At Chinsura, 18½ acres were taken over and sown with (*a*) Deswal (*C. C*) (Burdwan Farm seed), (*b*) Deswal from Serajganj (*C. C.*) and (*c*) Hewti of Rungpur (*C. C.*). Of the 18½ acres, about 14 acres produced an excellent crop of jute that should give an excellent crop of seed, the remaining 4 acres being a failure. Fifty four and a half maunds of seed have been obtained from this farm. The quantity of seed sent into the godown does not seem to represent the crop as seen standing just before harvesting.

The failure of the 4 acres was due entirely to the impossibility of preparing the land in time with hired ploughs. The following are the detailed results at the Chinsura Farm:—

Variety grown.	Area in acre thinned.	Outturn of seed in maunds, seers, etc.	Rate of yield per acre in maunds, seers, etc.
Hewti of Rungpur (*C. C.*) ...	2	6 24 0	3 12 0
Deswal (*C. C.*) (Burdwan Farm seed).	7	27 35 0	3 39 4·5
Deswal from Serajganj (*C. C.*)...	5	20 3 0	4 0 9·6
Total ...	...	54 22 0	

The accounts of all the farms are not quite completed, but the following statement gives an approximate total of the expenditure incurred at each farm :—

Particulars.	Purnea.	Berhampore.	Krishnagar.	Chinsura.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Cultivation charges, etc.	1,073 9 6	994 4 10	624 0 3	1,090 13 9
Pay of Overseer ...	675 0 0	640 0 0	637 8 0	660 0 0
Rent	90 0 0	Free	189 8 0	111 0 0
Cultivation charges for November.	112 0 0	30 0 0	Finished.	
Total expenditure...	1,950 9 6	1,664 4 10	1,451 0 3	1,861 13 9

At our last meeting, the following amounts were sanctioned: Purneah, Rs. 661-4; Berhampore, Rs. 914-4-10; Krishnagar, Rs. 621-5-9; and Chinsura, Rs. 970-6-3; remaining sums, viz.—Purnea, Rs. 1,299-5-6; Berhampore, Rs. 750; Krishnagar, Rs. 829-10-6; and Chinsura, Rs. 890-7-6 may be sanctioned by this meeting. At a price of Rs. 15 per maund of seed, the Purnea jute seed farm will be able to pay all expenses itself; but the remaining three farms show a net loss. The former is highly satisfactory, for it shows that the business of seedsmen, which is so highly remunerative a profession in other countries, may be carried out with advantage in this country, for with proper arrangements the return even at Purnea may be expected to be doubled, and the expenses to be lessened. The results of the last three farms are not disheartening when we consider how late we started, that we were entirely at the mercy of the local cultivators as regards ploughs and labour, and that the Overseers were inexperienced young fellows who had only just left College. The object of our Association, which is to obtain a good supply of first rate seed, has made much progress, for we have 268¼ maunds of jute seed with which to commence in 1907. Another year, we propose to rotate cow-peas with jute on each farm in the same year, so that we may recommend green manuring more, and have the necessary seed to carry out the suggestion.

For 1907, it should be decided at once what farms will be continued. Purnea, Berhampore and Chinsura may be continued, but unless we can obtain part at least of the original area chosen by our Department, the Krishnagar farm may be given up, for nearly half the area is high sandy land and unsuitable to jute cultivation. Still one does not like to give up any land, till it has been finally demonstrated that no agricultural crop will thrive thereon. It is not out of the way to look five years ahead, and see each one of the present jute seed farms with an extended area and designated as a seed farm under Government control. The pioneer work of introducing in a practical manner the production of an improved seed supply will have been done by our Association, and as such this Association will have done a great, good and lasting work for the agriculture of this Province.

It is advisible to have our own bullocks, because with hired ploughs it becomes a matter of extreme difficulty when more than 10 acres have to be cultivated in this manner. Also the cost of so cultivating is very exorbitant. Bullocks will form an asset that can be sold at the end of our work.

Accommodation for bullocks and Overseers should be arranged for at each farm. This would not be difficult at Purnea and Berhampore, for fairly cheap arrangements can be made at the Bonbagh Factory in the former place, and at the Old Asylum in the latter case. At Chinsura, a high piece of land will have to be found and hired for the purpose.

If Krishnagar is discontinued, a sum of money could be spent in purchasing a good area of standing jute in the New Province and saving the crop of seed. Judging from the demands for jute seed that we received this year, the seed supply from our farms will not suffice for every one, and as jute is such an important crop, our Association will be doing an excellent work in supplying a good supply of seed.

This meeting should decide about the jute farms for 1907, so that work may be taken up at once, and so that there may be no delay at any of the farms.

F. SMITH,

Deputy Director of Agriculture, Bengal.

APPENDIX III.

Flax Cultivation.

Note on the results of the cultivation of Russian (Riga) flax seed distributed in 1906.

The following reports have been received up to date in respect of the seed distributed in the Province of Bengal:—

(1) The Rev. H. Gengler, S.J., sowed half an acre on sandy loam at Krishnochandrapur, Morbhanj State. The seed was sown in October and the crop harvested in the beginning of February. There was no rain after the 28th of October, and the plants accordingly suffered for want of moisture. The plants reached the height of 1½ feet, but only produced 3 seers of seed. This gentleman suggests that the seed should be sown early in September, so as to ripen in the beginning of January.

(2) Babu G. B. Chattopadhya sowed 2 *kathas* (=$\frac{1}{30}$th acre) of loamy soil at Sadhupati, Jessore. The seed was sown on the 27th of November and manure applied. This correspondent writes that the plants dried up suddenly after the first watering, but he cannot trace the cause for this. The plants reached a height of 2 feet, but showed no sign of flowering.

(3) Mr. H. Ricketts sowed 1 lb. of seed at Gulzarbagh, Patna. The seed was sown on the 13th November and harvested on the 3rd of March. The plants reached 3½ feet in height, the local varieties attaining a height of about 1 foot only.

(4) The Manager of the Jogapur Concern, Saran, sowed 4½ acres of light clay on the 6th November, harvesting at the end of February. The rainfall was very deficient at the time of early growth, and the plants were irrigated by *sith* (indigo refuse) water. The outturn is reported to have been 22½ maunds of "stalks" per acre.

(5) Mr. C. H. Edgell of Harsingpur, Darbhanga, reports that owing to want of rain and attacks of insects, the flax was a complete failure.

(6) Mr. E. H. Hudson, of Rajpur, Champaran, sowed 8¼ acres of both light and heavy soil (chiefly the latter), and obtained 636½ maunds of green straw with seeds. He remarks that the season was a very abnormal one and detrimental to all the *rabi* crops, and that he obtained a much better crop of flax in the previous year.

(7) Mr. E. Shearer, Imperial Agriculturist, Research Institute, Pusa, sowed 6 acres of sandy loam on the 22nd of October, harvesting from the 19th to the 21st of February. Maize had been previously sown on the land, but this was destroyed by a flood. Mustard cake, at the rate of 5 maunds per acre, had been applied for the maize. The following is the outturn reported:—

(*a*) From seed sown at the rate of 200 lbs. per acre, 14 maunds of plant per acre.
(*b*) Ditto ditto 160 lbs. ditto 7½ ditto ditto.
(*c*) Ditto ditto 120 lbs. ditto 7 ditto ditto.
(*d*) From seed sown at the rate of 24 lbs. per acre for seed purposes, 8 seers per acre of seed were obtained. Mr. Shearer reports that the seed was sown late, the season was a very bad one, and the soil was very poor. He thinks the trial was not a reliable one.

(8) Mr. A. A. Murray sowed 1⅝ acres of high sandy soil in the Muzaffarpur district on the 28th of November, and obtained 34½ maunds of plant and 2⅝ maunds of seed per acre Weather conditions were unfavourable and the crop was uneven.

(9) Mr. L. W. Macdonald of Partabpur Factory, Saran, sowed 2 acres of light sandy soil. The seed was sown broadcast between the 25th and 31st of October. He reports that the seed was excellent, but has given no figures of outturn.

(10) Four and-a-half acres of clay loam were sown with the seed at the Bankipore Experiment Station by this Department. The seed was sown at the rate of 2 maunds per acre from the 12th to the 20th of November, and harvested from the 5th to the 12th of March. The weight of unrippled green plant on the 12th of March was 270 maunds, or 60 maunds per acre. The total weight of seed obtained was 6 maunds 12 seers.

The Director of Agriculture, Burma, reports that the experiment with Russian flax during the past season proved a total failure, but that further experiment will be made.

The reports from other Provinces have not yet been received.

Copy of a preliminary note by the Flax Expert employed by the Bihar Indigo Planters' Association is annexed.

Copy of a report received from the Director, Imperial Institute, London, on two samples of flax grown at the Departmental Agricultural Station at Bankipore is also annexed.

C. A. OLDHAM,
Director of Agriculture.

Preliminary note on flax cultivation in Bihar

By M. Emil Vandekerkhove, Flax Expert to the Bihar Indigo Planters' Association.

Field Cultivation.—(*a*) *Method of sowing.*—I believe in sowing by drill in India because the seeds are buried at equal depths in the ground and consequently more even germination results, which is of great importance.

Remark.—In this matter I have not yet gained enough experience of the soil and climate, which are very different to those at home; these things have to be found out gradually and improvements made. In my next report I will give a more definite opinion.

(*b*) *Length and quality of flax as compared with Belgian and American flax.*—Very short straw for a planter who grows a crop is never desirable, as a very low percentage of yield per bigha is obtained.

There is, however, a fair demand for short fibre *of good quality.* The most desirable length is from 28 to 35 inches. There is a small demand for longer fibre, but as a rule it is not very much liked.

The several lengths of fibre we are getting here are the same as they are getting in Belgium, France and Holland, but the quality is on the average very much lower. As far as I know, in America flax is only grown for seed, and not for fibre.

(*c*) *Thickness and thinness of sowing.*—We sow in Belgium from 300 to 370lb. per *hectare** of flax seed, according to the condition of the seed and the inclination of the farmer, adding 50 pounds of seed where the soil is poor.

(*d*) *Manuring.*—Manuring for flax is preferably done the season previous. Flax should not be forced by heavy manuring, but should be made to grow gently and steadily. With cool cloudy weather during flowering and ripening a good return is certain, unless the soil is overcharged with what we call "salt"—I believe the English chemical name is "nitrate of soda."

Some farmers at home apply this "salt" when their soil is very poor, but as a manure for flax it nearly always produces small fibre and green straw, the green colour remaining after retting and scutching.

Steeping or Retting.—After the experiments carried out at Dooriah, I found that the "underflowing water system" was the best, but in this matter I am not quite convinced, because I know from the experiments I saw at home and their splendid results that the other system called the "Bernhem" must be very good.

I note that all our flax was in a state of over-ripeness and had been very much exposed to rain, dust and sunshine, causing the fibre to be very badly stained, and thus rendering the experiments difficult of interpretation.

Machinery Necessary.—For retting daily pumping is required to supply the tanks with fresh water.

For scutching, apart from the boiler and engine, we calculate roughly 4lb. per scutching plank, which produces on an average 35 pounds of fibre per day, using at the rate of one horse-power to every 3 planks. This will for Indian conditions have to be reduced by a half.

Fibre.—(*a*) *Quality and class as compared with Belgian, &c.*—The quality here is poor and may only be classified, on an average, as the second lowest, as compared with Belgian fibres. [N. B.—All the winter crops were bad, but from statements made by Mr. Hay Cameron, Manager of Dooriah Factory, one must be convinced that India is able to produce better crops]

(*b*) *Approximate value per ton and output per acre.*—Compared with Belgian fibres, the average value per ton should be from £40 to £50 varying according to the market, and the prejudices of the buyers against systems of retting other than the Belgian river system. The average output at Dooriah this year has been about 22 maunds of dry rippled straw per acre. It is to be noted that both the value and the output as compared with Belgian can easily be increased by nearly half.

Labour.—*If Indian coolies can be easily taught.*—I am surprised at the quickness with which the coolies learn. The scutching of low-priced fibres is very well advanced.

At Doorish in the drying fields the labourers are tractable and useful and give no trouble, if properly supervised. The process of retting requires more study, and more experience is required in regard to the qualities and classes of fibre; but most of the best scutchers could be taught enough for ordinary purposes.

Report received from the Imperial Institute, London, on Flax from Bengal.

By Professor Wyndham R. Dunstan, M.A., F.R.S., Director.

The sample of flax which is the subject of this report was forwarded for examination to the Imperial Institute by the Director of Agriculture, Bengal, with a letter No. 1884 A., dated the 4th April 1907. It was stated that the flax had been grown from Riga seed at the Bankipore Agricultural Experiment Station.

The sample consisted of two bundles of flax straw, weighing 4 lb. 4 oz. and 5 lb. 2 oz., respectively.

The straw, which had not been retted, was straight and generally not branched except towards the upper parts. Colour varied from green to pale yellow. The fibre could be easily separated from the yellow portions by breaking the straw, thus indicating that the material had become partially over-ripe.

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* Note.—One *hectare*=2·4711 acres.

The following results were obtained on comparing the sample with a standard specimen of flax straw grown in Belgium:—

	Flax straw from Belgium.	Flax straw from Bengal.
Length of straw ...	30 to 36 inches.	30 to 42 inches.
Diameter—maximum ...	0 064 inches	0·132 inch.
,, minimum ...	0·032 ,,	0·041 ,,

It will be noticed that the flax from Bengal was longer and coarser than the standard sample of Belgium flax used for comparison.

The clean fibre obtained from the Indian straw had an average diameter of 0·00094 inch, the diameter of the standard sample of Belgian flax being 0·00086 inch.

The sample under examination was therefore generally coarser than the Belgian specimen.

The straw was well grown, but it seems probable that insufficient seed had been sown as a considerable amount of wood had developed in parts of the straw. The presence of woody tissue interferes with the process of retting and causes the fibre to be damaged in the subsequent breaking operation.

The quantity of seed usually employed in flax cultivation is from 2½ to 3 bushels per acre, but double this quantity is sometimes used, in which case the young plants require to be thinned out.

In order to ensure the production of the best quality of fibre, the flax straw should be gathered when the lower half has turned brownish-yellow. If the plants are left in the ground until the whole stem is yellow or brown and the plant is fully ripe, the flax obtained will be coarse and of inferior quality.

With greater care in cultivation it is highly probable that flax of excellent quality could be grown in that part of Bengal where the present sample was produced.

APPENDIX IV.

Agricultural Experiment Stations.

Burdwan.—At this station the work on paddy, jute, and potatoes commenced in previous years was continued. Full details will be found in the Annual Report of the station for 1906-07. The most important conclusions drawn from the results are that the two crops, paddy and jute, or potatoes and jute, can be grown on the same land in the same year. When the two crops are grown only one requires to be manured, viz., the jute crop in the rotation paddy after jute, and the potato crop in the rotation potato after jute. In the case of such rotations a good manure for jute is 135 maunds (5 tons) of cowdung, and for potatoes either:—

(1) 240 maunds cowdung,
(2) 22½ maunds castorcake, or
(3) 200 maunds cowdung, 3 maunds superphosphate and 3 maunds saltpetre per acre. These applications are recommended to the local cultivators.

When paddy is the only crop taken off the land the following manurial applications have given the most economical results:—

(1) 3 maunds bonemeal and ¾ maund saltpetre, and
(2) 50 maunds cowdung.

Experiments to ascertain the best number of seedlings to plant per hole were continued during the year, and the result corroborated that of the preceding two years, viz., that planting one seedling per hole at a distance of 12 inches apart gives the best outturn. The experiments in green manuring have shown that for *aman* paddy green manuring with jute or with *dhaincha* is very economical. In the manure experiment with potatoes, a plot was added to test manures that have given the best returns in Europe, namely, cowdung, superphosphate and saltpetre. The result was satisfactory, the application of 200 maunds of cowdung, 3 maunds of superphosphate, and 2 maunds of saltpetre per acre giving an outturn of 203¼ maunds. Castor-cake, however, continued to give the best results with potatoes.

The total expenditure during the year amounted to Rs. 4,954 and the receipts to Rs. 2,872, as compared with Rs. 4,593 and Rs. 1,643, respectively, in the preceding year. The cost of the up-keep of this station is generously borne by the Maharaj Adhiraj of Burdwan, to whom the cordial thanks of the Department are due.

Dumraon.—At this station experiments continued to be carried out in respect of sugarcane, wheat, mustard, and oats. The results of the sugarcane experiments point to the conclusion that *khari* is a much hardier variety than the local *mango* cane, and yields a much heavier outturn per acre; that the trench and furrow system (the so-called Bihar Planters' system) of cultivation gives better results than the local practice of planting behind the plough; and that the application of 200 maunds of cowdung and 8½ maunds of castor-cake per acre can be recommended as economical. In respect of wheat, it has been shown that the Muzaffarnagar soft white and the red *deshi* variety of the United Provinces

are more prolific than the local varieties. The Deputy Director recommends local cultivators to change their seed every second year. In the manuring experiments with wheat 80 maunds of poudrette has given the most economic results; cowdung (83 maunds) comes next. The experiments with different varieties of mustard during the year have corroborated the experiments of the preceding three years, in showing that the Jabalpur and Raipur varieties give better returns than the local variety of the district. The local variety of oats, known as Dumraon oats, continues to give the best results, and the Deputy Director recommends this variety to the attention of the cultivators. It has been shown at this station that jute can be well grown, provided water is availabe for irrigation. The total expenditure at this station during the year was Rs. 3,405, and the receipts Rs. 1,202, as compared with Rs. 3,200 and Rs. 2,513 in the previous year. The cost of the up-keep of this station is borne by the Maharani Sahiba of Dumraon, and the thanks of the Department are due to her for her public spirit and the interest she takes in agricultural development.

Cuttack.—The principal work during the year at this station was with paddy, jute, potatoes, and groundnut. The experiments with paddy have to a considerable extent corroborated the results obtained at the Burdwan Station, namely, that 50 maunds of cowdung or 3 maunds of bonemeal and 30 seers of saltpere per acre are the most economical applications, and that planting one seedling per hole about 12 inches apart gives a better result than planting several seedlings per hole. During the year the same experiment was carried out as at the Burdwan Station in regard to growing of winter paddy after jute on the same land in the same year. The result fully corroborated the experience at Burdwan. An average crop of $16\frac{2}{3}$ maunds of jute and 18 maunds of paddy (grain) *plus* $34\frac{1}{2}$ maunds of straw was obtained per acre. In this rotation the Deputy Director has recommended that in the Cuttack district the jute crop should be sown in the last week of March, and harvested in the latter half of July. It has also been shown at this station that potatoes can be profitably grown after jute on the same land in the same year; but in the case of both of the above rotations manure should be applied to one crop, as the soil is very poor. Italian and Patnai potatoes were very successfully cultivated. In the case of groundnuts the results have been most encouraging, and there is already evidence that this crop has attracted the attention of the cultivators in different parts of this and the neighbouring districts. Both potato seed and groundnut seed was distributed from the farm to members of Agricultural Associations in the Division with a view to acquainting the people with the value of these crops. A special feature of this station has been the training of students and cultivators deputed with stipends to work on the farm and gain a practical acquaintance with the methods followed. The Department stocked a number of improved sugarcane presses at this station, hiring them out to cultivators in the neighbourhood, to show them the advantages of using these mills. They were eagerly taken, showing that there is scope in this district for some enterprising firm to start a depôt for the hiring out of iron cane mills. The expenditure during the year amounted to Rs 10,755 and the receipts to Rs. 3,466, as compared with Rs. 6,787 and Rs. 1,865, respectively, in the previous year. The increase in expenditure is entirely due to charges on account of new buildings and repairs to old buildings. The charges on account of this station are borne by Government.

Bankipore.—Close to Bankipore an area of 210 acres was taken up during the year to form a new Agricultural Experiment Station. The soil is a clayey loam. The work done during the year consisted chiefly in levelling up and laying out the area and preparing it for experimental work. The land has been completely fenced in, roads constructed, an irrigation channel made from the canal distributary, cattle sheds, manure pits, Superintendent's quarters and labourers' quarters constructed, and the farm fully stocked with suitable cattle. The experimental area is now being laid out in plots, and a masonry silo, store-room, hay-shed and quarters for Overseer-Fieldmen are being constructed. Crops are being grown with the object of obtaining uniformity of conditions, and it is hoped that in another year or so experimental work may be commenced. The expenditure during the year amounted to Rs. 1,13,488. This will be one of the Government Agricultural Stations.

Sabaur.—At Sabaur, near Bhagalpur, an area of 324 acres was acquired and taken possession of during the year for the construction of the new Provincial Agricultural College and connected buildings and for an Agricultural Experiment Station. Most of the farm buildings, as well as the Superintendent's quarters, were constructed during the year, the land completely fenced in, roadways made, and the farm stocked with a full supply of good cattle. On this site a good deal of work was required in clearing the ground, removing *bastis*, and levelling up. Crops were grown during the year with a view to obtaining uniformity of conditions, and preparation generally made towards adapting the site for experimental work. The expenditure during the year amounted to Rs. 1,45,533. This will be another large Agricultural Station, the cost of which will be borne by Government.

Sibpur.—This Agricultural Station is under the management of the Educational Department, and is maintained chiefly for the instruction of the Agricultural students at the Civil Engineering College. The experiments conducted in previous years on the manuring of jute, paddy, and sugarcane were continued. The experiments on potato cultivation were temporarily suspended owing to an outbreak of disease in the crop of the previous year. An application of 10 maunds of castor-cake per acre again gave the heaviest outturn of grain and straw in the case of paddy, but a larger net profit was obtained by using 150 maunds of cowdung per acre. In the case of sugarcane, the application of 10 maunds of bonemeal and $2\frac{1}{2}$ maunds of saltpetre per acre gave the best return. In the variety experiments with paddy, *dudhkalma* gave the heaviest yield as in the previous years, *kalajira* and *samudrabali* coming next. Experiments were also made with mangel wurzel, the seed of

which was supplied by the Agricultural Department. The average yield was 200 maunds per acre. Common salt proved to be a valuable addition as manure for this crop. The income of the farm during the financial year ending on the 31st March 1907 was Rs. 1,082 as compared with Rs. 1,116 in the preceding year; and the expenditure amounted to Rs. 3,645 against Rs. 3,620. A rain-gauge was set up on the farm during the year.

Sripur.—The Superintendent's report has not been received in time to be incorporated.

APPENDIX V.

Agricultural Fairs and Shows.

Suri Cattle and Produce Show.—This show has been held now for 11 years. This year it was opened on the 28th January and lasted for 4 days. The Director of Agriculture and the Superintendent of the Civil Veterinary Department attended the show. An Inspector and a Travelling Overseer of the Agricultural Department demonstrated the working of some agricultural implements and exhibited some approved seed and manures and explained their special advantages to the raiyats. The number of exhibits, especially in the cattle section, was small, and there was a smaller attendance of people than last year, which is attributed to the counter attractions of the Industrial Exhibition and the Minto Fete in Calcutta, and to the abnormal prevalence of fever throughout the district. A sum of Rs. 300 was contributed from Provincial Funds in aid of the exhibition, and Rs. 50 were paid from the Imperial Fund for special prizes for country-bred cattle. A special section was opened this year for exhibiting agricultural produce raised by members of the District Agricultural Association, which added to the interest of the exhibits. Several varieties of cotton, *samundrabali* paddy, Central Provinces *aus* paddy and English vegetables were exhibited in this section, for which prizes were awarded.

Bankura Agricultural and Industrial Exhibition.—This exhibition was open from the 9th to the 18th February 1907, both days inclusive. The number of exhibits, both in the agricultural and in the industrial sections, was greater than last year, and there was a general improvement. Among the exhibits there were improved hand-looms, knitting machines, carpet-weaving looms and fibre extracting appliances, besides a number of improved agricultural implements. The rearing of silk worms and the spinning of cocoons was also demonstrated by the Bengal Silk Committee. Field and garden crops were fairly well represented. The Government grant-in-aid to this show was Rs. 300.

Midnapore Industrial and Agricultural Exhibition.—The exhibition, the third of its kind held at Midnapore, was opened on the 21st February 1907 by the District Magistrate. It was divided into two main sections, viz., industrial and agricultural. Silk, tasar, cotton goods, steel trunks, Morbhanj horn work and various articles of art, vegetables and garden produce, varieties of paddy (about 200), pulses, sugarcane, fruits, etc., were exhibited. Prizes to the value of Rs. 1,425 were distributed among the successfull exhibitors. Government gave a grant-in-aid of Rs. 300. An Agricultural Inspector demonstrated he use of improved agricultural implements and dairy applicances.

Chinsura Agricultural and Industrial Exhibition.—This exhibition was the first of its kind in the district of Hooghly and was opened by the Commissioner of the Burdwan Division on the 27th February 1907. It remained open till the 9th March and was free to the public. The total number of visitors is reported to have been not less than a lakh, and the number of exhibits in both sections (industrial and agricultural) was 3,221. Considering that this was the first show, it was quite a success. Encouragement should be given to exhibitors by the grant of better prizes. Government contributed Rs. 200 towards the cost of the exhibition.

Baraset Agricultural and Industrial Exhibition.—This exhibition was opened on the 18th January 1907 and continued for two days. The number of exhibits was not large owing to the counter attraction of the Calcutta Industrial Exhibition. The exhibition was however fairly well attended, and advantage was taken of the occasion to circulate and explain different leaflets issued by this Department, especially those on jute and paddy. One result of this exhibition is that a local committee has been formed for the dissemination of a knowledge of the results obtained by the experimental work being conducted by this Department. A portion of the balance of the exhibition fund was utilised in purchasing bonemeal and saltpetre for free distribution to cultivators. Government gave a grant-in-aid of Rs. 200.

Jhenidah Exhibition.—This, the second, exhibition was held on the 4th March 1907 and six following days at the subdivisional head-quarters of Jhenidah in the district of Jessore. Owing to scarcity prevailing in the district, the number and quality of the exhibits were unsatisfactory, and the attendance of cultivators, for whose benefit the exhibition was established, was very small. A Travelling Overseer was present to demonstrate the working of improved agricultural implements. The Government grant was Rs. 150.

Khulna Exhibition.—This exhibition was held in the town of Khulna from the 8th to the 17th of February 1907. It consisted of two departments, viz., the exhibition proper and the cattle show. Sports and amusements were also provided. The Magistrate acted as President. The exhibition proper was divided into three sections, viz., (*a*) Agriculture, (*b*) Industries, and (*c*) Arts. In the agricultural section various kinds of paddy, jute, cotton, potatoes, sugarcane, vegetables, fruits, etc., were exhibited as well as some dairy produce.

A Travelling Overseer from this Department demonstrated the working of several agricultural implements. The show of cattle was very poor. Rupees 500 were granted from Provincial Funds in aid of this exhibition and Rs. 75 from Imperial Funds for special prizes to cattle. His Honour the Lieutenant-Governor visited the exhibition.

Bihta Agricultural and Industrial Show.—This show was held on the 13th February 1907 in connection with the annual Sivarati cattle fair. The number of exhibits in the industrial section was larger than last year. In the agricultural section, the chief feature was the practical demonstration of the working of some ploughs sent to the show by this Department. It is hoped that the agricultural side of this show will be developed. Rupees 150 were granted from Provincial Funds in aid of the exhibition, and Rs. 125 from Imperial Funds for special prizes to cattle. Babu Debi Lal, Honorary Secretary to the Managing Committee, has been specially commended for his work in connection with the show.

Bihar Industrial and Agricultural Exhibition.—This exhibition used to be held in previous years at Sonepur in connection with the Sonepur fair. But last year it was held at Bankipore. Works of art and industry and agricultural produce from all the districts of the Patna Division and from a few districts of the Bhagalpur Division were exhibited. A special section was set apart for work done by Indian ladies. The agricultural part of the exhibition was fairly successful. Arrangement was made for the demonstration of improved agricultural implements. An Inspector from this Department showed and explained the working of diary and agricultural appliances. The Director of Agriculture, the Deputy Director, and Mr. Corbin attended the exhibition and helped the Judging Committees. Government contributed a sum of Rs. 500 in aid of the exhibition.

Rafiganj Cattle Show.—This cattle show was held on the 13th to 27th April 1907 at Rafiganj in the Gaya district. Owing to the prevalence of plague the attendance was poor. The indigenous cattle were very poor. The best animals were brought by dealers from the Shahabad district. Rupees 50 from the Imperial grant were distributed in prizes.

Barahpur Horse and Cattle Show.—This show, which is one of the large cattle fairs in the province, was held on the 11th and 12th February 1907. Bad weather prevented many people from attending. There was also an agricultural section, which does not appear to have been very successful. Mr. Quinlan of the Civil Veterinary Department and Mr. Smith, Deputy Director of Agriculture, attended the exhibition and helped the Judging Committees. Rupees 150 were given as a grant-in-aid from Provincial Funds.

Sonepur Fair.—The fair commenced on the 25th October and closed on the 8th November 1906. The sanitary and conservancy arrangements were good, and there was no outbreak of cholera or plague. The estimated number of animals brought to the *mela* for sale was as follows:—elephants 673, bullocks 23,000, horses 5,000, cows 1,000, buffaloes 750, camels 56, birds 2,000. Of these 603 elephants, 19,000 bullocks, 4,000 horses, 700 cows, 500 buffaloes, 40 camels and 1,400 birds were sold. The cattle show was held on the 31st October 1906. The Judging Committee consisted of the Superintendent, Civil Veterinary Department, the Collector of Saran, and two other European gentlemen. Twenty-one prizes, to the value of Rs. 305, were awarded, Government contributed Rs. 200 in aid of the cattle show.

Husseypore (Hathwa) Cattle Show.—This exhibition was held at Husseypore with a view to give a stimulus to the improvement of the local breed of cattle in the district of Saran. There was a great falling off in the number of cattle exhibited, which is attributed to the inclemency of the weather and to the general failure of the harvests. The Hathwa Raj contributed Rs. 600 to the exhibition fund, and Rs. 75 and two medals were granted from the Imperial Fund for special prizes to cattle. The medals could not be awarded as the animals exhibited were too poor. The Director of Agriculture and Mr. Harris, of the Civil Veterinary Department, attended the show.

Sitamarhi Cattle Fair and Show.—A large cattle fair is held annually at Sitamarhi in connection with the Ramnomi festival, and a show is held on the following day. This year the cattle show was held on the 23rd April 1907, and out of 80,000 head of cattle estimated to be at the fair only 279 were exhibited for prizes. A sum of Rs. 385 was allotted for these prizes, of which Rs. 235 were awarded. A special feature of this year's show was that an agricultural and industrial section were added. The number of exhibits in these sections however was not large. Government contributed Rs. 100 in aid.

Tintanga Agricultural Show.—This *mela* commenced on the 29th January 1907, and was more successful than in the previous year. At a meeting of the District Agricultural Association held on the 15th October 1906, it was resolved that prize winners should be given the option of prizes in seeds instead of in cash. Some 30,000 people were assembled on the busiest day. An Agricultural Inspector of this Department was deputed to demonstrate the working of improved agricultural implements and distribute leaflets. He also delivered a lecture in Hindi on the cultivation of jute. Government made a grant-in-aid of Rs. 150.

Khagra Cattle Fair.—The cattle fair commenced on the 28th December 1906 and lasted for one month. About 12,000 head of cattle were brought into the fair from neighbouring districts. Some Bhutia ponies were also brought for sale as well as elephants and camels. A cattle show was held in connection with this fair on the 7th January, which was attended by an Inspector of the Civil Veterinary Department. Government contributed Rs. 200 from Provincial Funds, and Rs. 50 and two medals from the Imperial Fund.

Kalimpong Mela.—This *mela* was held on the 28th November 1906. The exhibits consisted of ponies, mules, donkeys, Sri cattle, sheep, goats, pigs, poultry, grain, roots,

vegetables, dairy produce, forest produce, and the outturn of local industries. The total number of entries in all sections was 1,186, and prizes to the value of Rs. 1,276 were distributed to the successful exhibitors. Colonel Raymond, Superintendent, Civil Veterinary Department, and Mr. D. Quinlan attended the *mela*. It is reported that there has been no improvement in the quality of animals exhibted. A grant of Rs. 350 and two silver medals were offered by Government from the Imperial Fund as prizes for Sri cattle, but only Rs. 170 were awarded. In other respects the *mela* was succesful. Government contributed Rs. 500.

Kurseong Horse and Flower Show.—This show was held on the 1st April 1907. The date was somewhat early for flowers and the exhibits were therefore fewer than in past years. The vegetables exhibited are reported to have been the best ever shown in Kurseong. The entries for the pony classes were well up to the average. But the cattle were poor. The poultry exhibits were satisfactory. Rupees 200 were paid out of the Provincial grant in aid of this show.

Bagdogra Mela (Darjeeling Terai).—This *mela* was started in 1904 as a cattle fair and has since continued as an annual institution. It was held this year from the 29th January to the 2nd February. The exhibits of poultry, vegetables, fruits and local industries were not numerous, and were poor in quality. It is proposed to hold the *mela* on a sounder basis next year. Government contributed Rs. 150 in aid of the fair.

Kendrapara Industrial and Agricultural Exhibition.—An industrial and agricultural exhibition was held for the first time at Kendrapara during the year under report. It was opened on the 1st March 1907 and closed on the 10th idem. The number of exhibits in all was nearly 2,000, and altogether about 50,000 people are said to have visited the show, the majority of whom were agriculturists. No gate money was charged. Lectures on improved agricultural implements and on the cultivation of cotton, jute, potato, and groundnuts were delivered by a Special Overseer deputed for the purpose by the Agricultural Department. Government contributed Rs. 150 towards the exhibition.

Balasore Exhibition.—An agricultural and industrial exhibition was held for the first time at Balasore on ths 15th March 1907, which lasted for eight days. Industrial and agricultural exhibits were collected chiefly from the districts of the Orissa Division and from the neighbouring Native States. Among the agricultural exhibits, the drought-resisting and flood-resisting varieties of paddy formed a special feature. Arrangements were made for the demonstration of fly-shuttle looms and improved ploughs. Tanning and shoe-making were also shown. Jute, cotton, tobacco, sugarcane, various kinds of paddy, oil-seeds, pulse, lac, silk and tasar cocoons, and different kinds of fibres were exhibited in the agricultural section. Mr. N. N. Banerji, Personal Assistant to the Director of Agriculture, was present at the opening ceremony and explained in a sport speech the advantages of adopting improved methods of agriculture. Government contributed Rs. 300 in aid of this exhibition.

Angul Exhibition.—This exhibition, which is known as the Garhjat Agricultural and Industrial Exhibition, was held at Angul for about a week, commencing on the 8th March 1907. The total number of exhibits was 1,180, of which 783 were agricultural and 374 industrial. There were also 23 entries in the cattle and poultry section. A sum of Rs. 433 was awarded in prizes. In the agricultural section, the collections of cotton and potatoes were the best; some good silk was also exhibited by the Dhenkanal State. Different varieties of paddy, forest produce, oil-seeds, pulses, cereals, jute, tobacco, sugarcane, etc., were also exhibited. The industrial section was a success. About 15,000 persons representing all classes of the people attended the exhibition, which is growing in importance. Government contributed Rs. 300 to the show.

Sambalpur Agricultural Show.—This show was held for the second time at Huma, Sambalpur, on the 11th February 1907, and continued for three days. The exhibits consisted chiefly of agricultural produce of different kinds of agricultural implements and articles of local manufacture. Tha cattle exhibits were few and poor. Prizes amounting to Rs. 710 were distributed to the successful competitors. It has been suggested that the exhibition should be held at Sambalpur town, which is more central for all parts of the district. Government contributed Rs. 300.

Hazaribagh Fair.—An agricultural and cattle show was opened at Hazaribagh on the 15th December 1906 and lasted till the 22nd idem. As this was the first exhibition in the station comparatively little interest was taken in it by the cultivators. The Provincial grant-in-aid was Rs. 300, and Rs. 75 and two medals were allotted from the Imperial Fund for special prizes to cattle.

Ranchi Agricultural and Industrial Exhibition and Cattle Show.—This exhibition and cattle show was held at Chutia near Ranchi on 18th February 1907 under the auspices of the District Agricultural Association. It was the first of its kind in the district. A large number of exhibits, consisting of local agricultural produce, came in, of which tea, lac, cotton, and tasar cocoons were the most important. The exhibition was well attended. An Inspector of the Civil Veterinary Department was present and helped the Judging Committee of the Cattle Show. The value of prizes awarded at this exhibition was Rs. 164 for cattle, Rs. 161 for agricultural produce, and Rs. 116 for industrial exhibits, making a total of Rs. 441. Government contributed Rs. 300 in aid of this exhibition, and Rs. 100 and two silver medals were given from the Imperial Fund for special prizes to cattle.

Daltonganj Fair.—The fair began on the 15th January 1907 and closed on the 4th March. The closing was unusually delayed owing to a sudden outbreak of cholera in the town, it being considered desirable to allow the shop-keepers to remain on the *mela* ground. An attempt was made this year for the first time to have a cattle show, but this

was not a success owing to another cattle fair being held in the district at the same time. A vegetable section was attached to the fair, and Rs. 35 were awarded as prizes in this section. One of the Special Overseers of this Department attended the fair. The grant-in-aid from Government was Rs. 200.

Purulia Agricultural and Cattle Show.—This exhibition was held from the 4th to the 7th of February. Owing to heavy rain the gathering was smaller than in previous years. The exhibits consisted of agricultural produce, cattle, poultry, ponies, agricultural implements, and works of local arts and industries. Owing to other fairs being held at the same time, no officer could be deputed from the Agricultural Department.

APPENDIX VI.

An Account of the Scientific Work on Indigo during the year 1906-07.

A full account of the work done on indigo up to January 1907 was published early in the year in the form of a report to the Bihar Planters' Association which must be consulted for full details. This report is divided into three main sections dealing with laboratory work, manufacture, and agriculture respectively. It will be well to maintain this system of subdivision in the following brief summary of the work up to date.

Laboratory Work.—A thorough revision of the published methods for the determination of indigotin in commercial indigo and in indigo-yielding plants has been carried out by Mr. Briggs and myself and the results embodied in a paper communicated to the Society of Chemical Industry in August last. The practical outcome of this work has been to show that the method employed both by Rawson and ourselves for the determination of indigotin in dealing with questions of manufacture is sufficiently accurate and that the conclusions arrived at are therefore reliable. In a paper published simultaneously and in the same journal by Bloxam, considerable doubt is thrown on this conclusion and an alternative method of analysis is proposed. This led to the necessity for a further communication from Mr. Briggs and myself which was published in the Journal of the Society of Chemical Industry of March 15th last. In this we have been able to show wherein Bloxam's criticisms of our work failed, and that the proposed alternative method does not give accurate results. A paper has also been published during the year by Orchardson, Wood and Bloxam dealing with the determination of indigotin in the plant. A modification of the method described by Mr. Briggs and myself is suggested by which it is claimed that similar results are obtained with greater expedition; these results are, however, said to be erroneous, and a third method is proposed by which considerably higher figures are given. This is a matter of very great importance since a correct estimate of the efficiency of any process of indigo manufacture depends upon the reliability of the methods of determining the indigotin obtainable from the plant. If the conclusion of Orchardson, Wood and Bloxam were correct, it would mean a possibility of improvement in the indigo manufacturing process of some 20 per cent. more than had been anticipated. A careful revision of the former work on the subject and an examination of the new method proposed has therefore been undertaken—the work is at present in progress, and so far shows no indication that the new views will be verified. The results will be published as soon as complete.

Some effort has been made during the year to attain some sort of uniformity in the trade analyses of indigo. It was ascertained by sending samples of known indigotin content to various analysts for examination that considerable discrepancy existed in their results. It is of some importance that dealings should be conducted at the distributing centres on a uniform analytical basis, and advisable that this basis should as nearly as possible reflect the true indigotin-content of the samples dealt with. To this end I have urged the uniform adoption of the method published by Mr. Briggs and myself, and have succeeded in securing its use by leading analysts both in Calcutta and England. The relative dyeing values of synthetic and natural indigo has been further investigated. Laboratory tests failed to disclose any material difference between the two substances provided vats were made up to contain corresponding quantities of indigotin. This was not in accordance with the view expressed by many practical dyers, and accordingly a test was carried out on a practical scale by way of final criterion. Two dye-vats and the necessary materials were very kindly supplied by the Cawnpore Woollen Mills, Co., Limited, and the test was carried out under the direct supervision of their chief dyer; the conditions employed were thus the ordinary routine ones of the dye-house. The dyes employed were carefully analysed before the vats were made up so as to ensure corresponding quantities of indigotin in each vat. A full account of the test showing the dyeings obtained was published early in the year; the results are strikingly in favour of the natural substance. It appears of great importance to the natural indigo industry that these results should be confirmed and amplified and explained if possible; to this end a dye-house has been constructed at Sirsiah, and it is hoped to carry out further work on the subject during the coming cold weather.

Further laboratory work dealing with problems of manufacture and constituents other than indigotin of the plant and finished indigo have been carried out and will be touched upon in the coming annual report of this station. Several routine analyses for planters have also been carried out.

Manufacture.—The manufacturing season was unfortunately shortened by floods which occurred in August and destroyed a large amount of the cultivation. The work accomplished was almost entirely devoted to a confirmation of the results obtained during the season 1905-06, on the efficiency of the steeping process carried out under varying conditions of time and temperature. It was found that with the Sumatrana plant seven hours' steeping at 104°F. gives the best results, and these conditions are recommended. With the Java plant, last year's conclusions were contradicted, a 7 hours' steeping at 104°F. giving better results than 10 hours' at 90°F. (this contradiction is explained by the fact that the plant worked with last year at Pusa was of a very inferior quality to that used this year at Sirsiah). Under both sets of conditions, however, the efficiency of the process is low, and the conclusion is arrived at that 12-13 hours at 90°F., and about 8 hours at 104° is required for Java plant in good average condition. This conclusions requires confirmation during the present season. Already a certain number of experiments have been carried out, but the plant used was uncommonly rich in colouring matter, owing to its having been cut before the break of the rains, and the results obtained with it cannot be taken as representing average conditions. As far as they go they indicate that plant cut at this stage requires steeping at a higher temperature than 90°F. in order to render the process of as high an efficiency as possible—13 hours at an average temperature of 93°F. is recommended.

Some experiments on the addition of alkali to the steeping vat and the exclusion of air from its surface were tried, but in neither case with satisfactory result.

The general conclusion arrived at is that with a steeping process correctly adjusted with regard to time and temperature and an oxidising process such as that devised by Rawson (the ammonia-gas process) there is little room for improvement in these main operations of indigo manufacture.

A good deal has yet to be done in connection with what may be called the subsidiary processes. Perhaps the chief possibility in this direction is in saving losses in seet-water. These losses amount to anything from 5 to 15 per cent. of the total indigo made, under certain conditions of manufacture, and may possibly be avoided by filtering the liquor after it is run off from the vat. An apparatus for this purpose was suggested by Rawson. I was unfortunately unable to obtain it in time for last season's "mahai," but it is now installed at Sirsiah and will be tried this year.

Considerable progress has been made in the direction of obtaining indigo in powder form. An experimental machine for the purpose was designed by Mr. Briggs and set up here during the year. It did not work quite satisfactorily, but the principle of the machine was proved sound and it appeared only necessary to make certain modifications in the mechanism and general structure to attain the desired end. A new machine involving these improvements has now been made and installed, and preliminary trials give promise that it will be a success. We hope to produce some quantity of indigo in powder form during the coming "mahai."

Agriculture.—The experiments in manuring indigo have not yet given any definite results. The seed sown on the plots described in last year's report failed to germinate satisfactorily owing to the disturbance which the soil had suffered, with the result that transplanting had to be resorted to and the plants were not all at the same stage of development when analysed in June and July. The results obtained are thus not strictly comparable. The only point clearly indicated is that planting indigo on freshly "seeted" land has distinct disadvantages, although the plant obtained is taller and apparently much finer than on land not so treated. The seet leads to very rapid development with the result that the indigotine-content of the leaf drops quickly after the maximum stage has been attained. In the majority of cases too this maximum is not as high as on land which has received no seet. The plots were all flooded in August so that no "khoontie" cutting was obtained from them. They were resown in October and the new plant has recently been cut and analysed but again no very definite conclusion can be drawn from the results.

The experiments in inoculating soil with cultures of indigo nodule bacteria, prepared according to the United States method, gave negative results. No benefit whatever resulted from the inoculation, and it is clear that the soils worked on are already sufficiently well-provided with the necessary nodule bacteria, and that they are in a sufficiently virulent condition. This is what was to have been anticipated and would, I think, prove true of all Bihar soils.

A number of sub-varieties of *Ind. Sumatrana* originally isolated by Mr. Leake in 1903 were grown at Sirsiah and their leaf-content and indigotin-content determined in July. The results show that, having regard to these factors and also to general vigour of growth, the Delhi plant is the most valuable. It is most desirable that pure seed of this strain should be cultivated for Bihar if possible, but this will involve a considerable amount of selection, since even seed obtained direct from the Delhi districts contains a large admixture of other sub-varieties. The seed-farm which has been established at Dasna in the Delhi district is now supplying seed which is

the nearest approach to this which is at present possible. We have recently acquired the services of Mr. J. G. Turnbull who will make the selection of both the Sumatrana and Java plants his special work. It is hoped that in this way pure strains of the most valuable varieties of each type will be isolated and established and a supply of their seed be gradually built up.

Quite satisfactory results were obtained with seed of the Sumatrana variety grown in Bihar; not only has the cultivation of the seed proved feasible, but the plant obtained from the seed has been found to compare favourably in every way with that obtained from seed grown in the North-West districts. Several planters kindly assisted me in testing this point and found that a somewhat larger yield of plant was obtained from the Bihar-grown seed than from the North-West seed. At Sirsiah we had sufficiently large plots to manufacture the plant derived from seed of each origin separately, and no material difference was found in their respective yields of indigo. It is thus shown feasible to grow Sumatrana seed in Bihar should it prove desirable, but, having regard to the fact that a somewhat smaller yield of seed is obtained in Bihar than in the North-West (doubtless due to the heavier rainfall during the flowering period), and to the greater expense of cultivation in Bihar, it is unlikely that anything will be done in this direction for the present.

Some experiments were carried out at Sirsiah on the rate at which it is most desirable to sow Sumatrana seed. The results indicated that it is of advantage to sow at a considerably lower rate than has been customary in Bihar, and I have asked several planters to assist me in confirming this by carrying out experimental sowings at various rates this year.

In connection with the Java plant a new method has been devised for treating the seed in order to promote germination. This consists in steeping the seed in strong sulphuric acid whereby the hard coat is ruptured and the penetration of water facilitated. The method is found to be superior to the mechanical scarification which was formerly employed in several respects and has been generally adopted by planters. An account of the scientific principle underlying the method was published by Mr. D. L. Day and myself in the "Annals of Botany" in January last, and two circulars issued to the members of the Bihar Planters' Association describing the practical application of the method in February and September of last year. A detailed account will also be found in my Annual Report.

Experiments have uniformly confirmed the superiority of the Java plant over the Sumatrana variety, both at Sirsiah and amongst planters. All experience goes to show that October is, under normal conditions, the right month in which to sow this variety in Bihar, and comparative experiments in methods of sowing indicate that it is safest to use the drill, though good results may also be obtained by broadcasting under certain conditions.

The conclusions arrived at with regard to cutting the plant back in the spring are as follows:—

I.—Cutting back is not likely to be of marked value in a thick crop.

II.—It should never be done later than February.

III.—It should never be done on plants less than a foot high, and this will generally be attained in February by plants sown in October.

IV.—In a thin crop, and on reasonably good soil, it is likely to be of the utmost value.

Three or four inches of stem should always be left to give rise to the new shoots.

Finally, the question of Java seed cultivation has received considerable attention The experiments on this subject described in last year's report showed that the heaviest yield of seed is obtained by leaving the plant unthinned and topping it at the break of the rains. This principle has accordingly been adopted on the seed-farms this year. It remains to be seen if the quality of the seed is as good as when obtained from thinned plant; in any case the difference is not likely to be marked in one generation. Further experiments in methods of cultivation have now been started, the chief among which are designed to determine the effect of growing the plant in strips of varying width.

C. BERGTHIEL,

Imperial Bacteriologist.

APPENDIX VII.

A list of Agricultural Implements and Machines which have been tested in Bengal during the year ending 30th June 1907 and of those in use which are reported to have been met with success.

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion of reporting officer.	Extent to which used by native cultivators.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Rs. A.					
1	Three-roller sugar-cane-crushing mill by Messrs. Apmuty & Co.	Crushing sugar-cane.	Efficiency ...	150 0	.....	Commissioner of the Patna Division.	.....	.....	
2	Three-roller sugar-cane-crushing mill by Messrs. Thomson and Mylne of Behea, Shahabad.	Ditto	Ditto	80 to 100	Messrs. Thomson and Mylne of Behea, Shahabad.	Commissioners of the Patna, Chota Nagpur and Orissa Divisions.	Very useful and appreciated by tenants.	Largely used by cultivators. 394 sold by Messrs. Thomson and Mylne during the year.	
3	Sugar-boiling pans	Manufacturing molasses.	Large quantity of juice can be boiled at one time and froth removed easily.	60 0	Ditto	Commissioner of the Orissa Division.	Molasses of better flavour is manufactured in these pans.	Largely used by cultivators.	
4	"Meston" plough	Ploughing ...	Worked by country bullocks.	4 4	.....	Collectors of Birbhum and Bankura and Commissioner, Presidency Division.	Ploughs slightly deeper and does more work than the country plough.	.....	
5	"Rajeswar" plough.	Ditto	Ditto	4 0	Agricultural Department, Bengal.	Collector, Bankura	Ditto	.....	
6	Hindu plough ...	Ditto	Ditto	13 8	Messrs. Leslie & Co., Calcutta, and Agricultural Department, Bengal.	Collector, Bankura, and Commissioners of the of the Presidency and Patna Divisions.	This plough does more than double the work of a country plough and cuts the ground much deeper. Very suitable for first ploughing.	Not used by cultivators.	
7	"Ransome" plough	Ditto	Inverts soil effectively.	22 8	Bengal Agricultural Department.	Commissioner of the Patna Division.	Very suitable for first ploughing.	Ditto.	
8	Bakhar of Bombay	Levelling earth and breaking clods.	Efficiency ...	2 0(*a*)	Bombay Agricultural Department.	Ditto	.....	Ditto.	(*a*) Price of different kinds of Bombay Bakhar stocked by this Department are:— Rs. A. (1) ... 4 4 (2) ... 7 8 (3) ... 9 0
9	Shibpur plough ...	Ploughing ...	Inverts soil effectively.	7 0	Bengal Agricultural Department.(*b*)	Commissioners of the Patna and Orissa Divisions.	It is not suited for the Angul district, being too heavy for the ordinary bullocks of the district.	Ditto.	(*b*) Not manufactured now. Not stocked by this Department.
10	"Howard" plough	Ditto	Inverts soil and ploughs to the depth of six inches.	35 0	J. F. Howard, Britannia Ironworks, Bedford.	Commissioner of the Patna Division.	An efficient and strong implement; well suited to eradicate weeds.	Used by a few cultivators on behalf of proprietors.	
11	Hindustan plough	Ditto	.....	15 12	Messrs. Jessop & Co.	Ditto	Useful	Not used by native cultivators.	
12	Four-pronged fork	Loosening soil ...	More useful than *kudalis*.	20 0 per doz.	Messrs. T. E. Thomson & Co., Calcutta.	Ditto	Do.	Ditto.	
13	Planet Jr. single wheel hoe.	Hoeing	Saves labour in hoeing.	25 0	Ditto	Deputy Commissioner, Hazaribagh.	Do.	Not used by cultivators on account of its high price.	
14	Rainforth & Son's winnowing machine.	Winnowing *rabi* crops.	Efficiency ...	.....	.....	Commissioner of the Patna Division.	Nil	Not used by cultivators.	

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion of reporting officer.	Extent to which used by native cultivators.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Rs. A.					
15	"Albion" reaping machine.	Cutting barley and wheat.	Chief advantage is its cheapness and rapidity in cutting, as also the manner in which it cuts *fallen* corn.	450 0	Messrs. Marshall Sons & Co., Calcutta.	Commissioner of the Patna Division.	Recommended for large agricultural farms.	Used by cultivators on behalf of proprietors.	
16	Vine fork	Preparing cane land.	Shoots are not destroyed.	14 0 per doz.	Messrs. T. E. Thomson & Co., Calcutta.	Ditto	Very useful ...	Not used by cultivators yet.	
17	Threshing machine.	Threshing ...	Efficiency ...	3,500 0	Marshall Sons & Co.	Ditto	Economical ...	Not used by native cultivators.	
18	Reapers	Reaping	Useful where hand labour is not to be used in harvest.	450 0	America	Ditto	Very useful ...	Ditto.	
19	Cultivators ...	Cultivating ...	.....	10 0	.....	Ditto	Useful	Ditto.	
20	Iron *don*	Lifting water from small depth.	More light and durable than wooden *don*.	8 0	Rampur Hat, district Birbhum.	.....	.....	Used by cultivators in certain districts of the Burdwan Division.	

APPENDIX VIII.

Expenditure on Miscellaneous Experiments and enquiries during the year ending 30th June 1907.

Experiments other than those made in Experimental Stations :—

	Rs.	A.	P.		Rs.	A.	P.
Central Seed Store				...	21,490	6	11
Supply and Services—							
Seed	6,252	11	5				
Manures	4,773	8	9				
Implements	2,866	8	0				
Other charges	3,900	11	6				
Rent of Seed Store ...	2,400	0	0				
Establishment—Pay and Travelling Allowance ...	1,296	15	3				
Special crops	...			...	66,555	13	7
Improvement and extension of cotton cultivation	1,555	13	7				
Contribution to the— ...							
Bengal Silk Committee ...	10,000	0	0				
Bihar Indigo Planters' Association	50,000	0	0				
Tea Association	2,000	0	0				
Jute experts	3,000	0	0				
Agricultural Association				...	26,887	3	2
Central Association ...	10,059	1	9				
Contribution to Divisional and District Agricultural Associations ...	12,000	0	0				
Books for Divisional and District Agricultural Associations ...	740	2	0				
Establishment—Pay and Travelling Allowance of Divisional Agricultural Inspectors	4,087	15	5				
Distribution of Agricultural Literature—							
Printing at private presses ...	1,953	4	0	...	1,953	4	0
Expert staff—Pay and Travelling Allowance of Travelling Inspectors and Supernumerary Officer	2,471	4	1	...	2,471	4	1
Miscellaneous	...			...	42,794	11	1
Contribution to Agricultural and Cattle fairs	6,600	0	0				
Temporary Establishment—Pay and Travelling Alllowance for Agricultural and Cattle fairs ...	991	0	10				
Implements for Agricultural and Cattle fairs	404	12	0				
Carriage of implements, etc., for Agricultural and Cattle fairs ...	436	0	6				
Deputation of students to foreign countries	18,233	2	0				
Deputation of officers to special duty	12,738	5	3				
Cost of bone-meal for free distribution	521	1	3				
Cost of sugarcane mills for demonstration	1,558	4	6				
Other charges	1,312	0	9				
Total ...	...				1,62,152	10	10

B. S. Press—23-8-1907—18506-600—J. S. and others.

REVENUE DEPARTMENT.

AGRICULTURE.

CALCUTTA, THE 21ST NOVEMBER 1907.

RESOLUTION—No. 3587.

READ—

The Report of the Department of Agriculture, Bengal, for the year ending the 30th June 1907.

IN compliance with the instructions of the Government of India conveyed in their letter No. 6—231-1, dated the 8th March 1906, the Report covers the period from the 1st July 1906 to the 30th June 1907. The Report has been submitted with commendable punctuality.

2. *Organization of the Department.*—The scheme for the development of the Department extending over ten years, which was referred to last year, has been followed as far as practicable. Proposals for the creation of Provincial and Subordinate Agricultural Services have been submitted to the Government of India. The organization of the central seed store was completed during the year, and an improved form of indent, as well as a form of report on experiments, were drawn up and distributed. Measures were taken to bring the Department into closer touch with agricultural shows and exhibitions. The supervision of the teaching in agricultural classes was transferred to the Department during the year.

3. *Scientific Experiments.*—The important experiments with jute on the lines indicated by the Inspector-General of Agriculture were continued during the year with satisfactory results. An account of them has been embodied in a vernacular leaflet, large numbers of which have been distributed throughout the jute-growing areas of the Province. A note showing the work done in connection with the selection of seeds and a *précis* of the reports on experimental cultivation of jute in Bihar are appended to the Report.

Owing to the repeated failure of the experiments with exotic varieties of cotton, experiments were made, during the year, with indigenous varieties and satisfactory results were obtained.

Interesting experiments were made with *aman* paddy and the *ikri* variety of sugarcane, and results were obtained which are of great importance to the cultivators.

4. *Irrigation.*—In accordance with the recommendations of the Indian Irrigation Commission, sanction was accorded, during the year, to the entertainment of an expert well-boring staff which would be prepared, free of charge, to make trial borings and improve the water-supply of existing wells by boring through strata impervious to the tools of the ordinary cultivator. A competent officer for this work has, however, not yet been found. The question of the employment of a special staff which would gradually draw up reports and maps showing, for each tract, the need of, and facilities for, additional small works of irrigation, such as wells, tanks, irrigation channels and embankments, and which would be prepared, free of charge, to give advice, to supply designs for embankments, sluices and escapes, and generally to aid the small proprietor or tenant to make the best use of his opportunities for improving the irrigation of his land, is at present under the consideration of Government.

5. *Agricultural Stations.*—A short account of the existing agricultural stations has been given in Appendix IV of the report. The laying out and stocking of the new agricultural station at Bankipore was continued. At Sabour possession was taken of the lands required for the Agricultural College and station; and much progress was made in clearing the lands. The site for an agricultural station for the upland tracts of the Chota Nagpur Division has not yet been decided on. A site near Chinsura

has been selected for an agricultural station for the delta districts, and steps have been taken for the acquisition of the land.

6. *Sericulture.*—The report of the Committee appointed to enquire into the state of the silk industry, the causes of its decline, and the remedial measures to be adopted, was submitted during the year; and a scheme prepared by the Director of Agriculture to give effect to the recommendations of the Committee is now under consideration. A contribution of Rs. 10,000 was made to the funds of the Bengal Silk Committee, the work of which continued to be carried on with care and ability. The Tasar Farm at Chaibassa is now fully equipped and the greater part of the area has been planted with *asan* trees.

The Lieutenant-Governor is glad to observe that sericulture continues to receive attention in the Moharbhanj, Keonjhar and Dhenkanal States.

7. *Agricultural Education.*—Ten students passed at the final examination from Sibpur. In view of the establishment of a Provincial Agricultural College near Bhagalpur, the agricultural classes at Sibpur will be closed after November 1908, and there will be no admissions to these classes during the current year.

Two more passed students from Sibpur were deputed, for further training, to the Cornell University in America. Sir Andrew Fraser is glad to observe that good reports have been received of the progress made by the students deputed in 1905 and 1906, and that one of them has obtained a high distinction. The Director of Agriculture will be asked to convey to Mr. Bailey, the Director of the Agricultural College, Ithaca, the thanks of the Lieutenant-Governor, for the personal interest he has taken in the welfare and progress of the Indian students.

A syllabus of Agricultural teaching for use in the Agricultural classes held at selected zilla and high schools was prepared during the year. Much difficulty is being experienced for want of competent teachers. The Director of Agriculture is endeavouring to remedy this in communication with the Education Department.

The question of practical training of the sons of cultivators is a very important one; and the Lieutenant-Governor notices with satisfaction that accommodation is being provided, at the new large agricultural stations, for students of the cultivating classes. His Honour hopes that local bodies, private zamindars, and estates under the management of the Court of Wards will avail themselves of the opportunity thus afforded of disseminating the results of experiments and of introducing improved methods of cultivation among the cultivators.

8. *Publication of Agricultural information.*—The Lieutenant-Governor notices with satisfaction that considerable progress has been made in the preparation and distribution of Agricultural literature, and that arrangements have been made for the issue of a journal by the Department quarterly.

9. *Agricultural associations, fairs and exhibitions.*—The Divisional and District Agricultural Associations did good work. Definite instructions have now been issued indicating the lines on which they should proceed.

The suggestion of the Director of Agriculture that more suitable prizes should be given at fairs and exhibitions is a good one.

10. *Indigo.*—The Government grant of Rs. 50,000 for research work in indigo was continued. The valuable work done by the staff employed on it has met with the commendation of the Bihar Indigo Planters' Association. It is satisfactory to note that the success of the experiments made in the manufacture of indigo and the cultivation of Java Natal seed, led to a general increase in the area sown with indigo in Bihar.

11. The thanks of the Lieutenant-Governor are due to Mr. C. E. A. W. Oldham for the good work done by him and for his excellent report. His Honour is glad to notice that Mr. F. Smith, Deputy Director, has continued to work with the greatest zeal; and he desires also to acknowledge the services of Mr. N. N. Banerji. The thanks of the Lieutenant-Governor are due to Dr. J. W. Leather, Imperial Agricultural Chemist, for the help rendered to the Department in making analyses of soils and manures and to Mr. T. R. Filgate, General Secretary to the Bihar Indigo Planters' Association, for the able manner in which he has guided the work of the Indigo Research

Committee at Sirsiah. His Honour also desires to place on record his appreciation of the valuable work done by Mr. Bergtheil and his assistants in connection with research work in indigo. It was with deep regret that the Lieutenant-Governor received the report of the death of Mr. N. G. Mukharji, who was for many years very closely connected with the Agricultural Department. He possessed great knowledge of sericulture as well as of agriculture; and it will be very difficult to fill his place.

By order of the Lieutenant-Governor of Bengal,

E. A. GAIT,

Chief Secy. to the Govt. of Bengal.

No. 3588.

COPY, with a copy of the Report, forwarded to the Appointment Department of this Government for information.

No. 3589.

COPY, with a copy of the Report, forwarded to the Director of Public Instruction, Bengal, for information, in continuation of this office endorsement No. 2936Agri., dated the 29th November 1906.

By order of the Lieutenant-Governor of Bengal,

W. H. BUCHAN,

Under-Secy. to the Govt. of Bengal.

CALCUTTA,
The 21st November 1907.

B. S. Press—28-10-1907—22989—768—T. N. R.

REPORT

OF THE

AGRICULTURAL DEPARTMENT,

BENGAL,

For the year ending 30th June 1908.

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DEPARTMENT OF AGRICULTURE, BENGAL.

No. 7157½A.

FROM W. R. GOURLAY, ESQ., M.A., I.C.S.,
Offg. Director of Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE,
LAND REVENUE DEPARTMENT.

Dated Calcutta, the 21st September 1908.

SIR,

I HAVE the honour to submit herewith the third Annual Report of the Agricultural Department, Bengal, for the year ending 30th June 1908.

CHAPTER I.

ADMINISTRATION.

1. *Charge.*—The Hon'ble Mr. C. E. A. W. Oldham, I.C.S., Financial Secretary to the Government of Bengal, was in charge of the Department up to the 11th of November 1907; I held charge during the rest of the year. Mr. F. Smith, B.SC., Deputy Director of Agriculture, was in direct charge of the Agricultural Stations, but the charge of the Home Farm attached to the Provincial Agricultural College at Sabaur was made over to the Principal. Mr. C. S. Taylor, B.A., Agricultural Chemist, and Mr. E. J. Woodhouse, B.A., Economic Botanist, joined the Department during the year. Both officers on their arrival underwent a preliminary training, Mr. C. S. Taylor under Dr. J. W. Leather at Pusa and Mr. E. J. Woodhouse under Professor A. Gammie at Poona. Mr. N. N. Banerjei continued to act as Personal Assistant to the Director. Mr. D. N. Mookherji was employed by the Department for nine months of the year on a survey of the varieties of wheat grown in the Province, on a survey of the soils and on an enquiry in connection with sugarcane. He also selected the site for a new Agricultural Station representative of the laterite area and made enquiries regarding the results of the use of bonemeal and saltpetre as manures for paddy in Burdwan, Hooghly and Birbhum.

2. Babu Nibaran Chandra Chowdhury held one of the posts of Travelling Inspector; the other post was held for a short time by P. G. Krishnan, but since his transfer to the Seed and Implement Store the post has been vacant. The Assistant Entomologist and the Assistant Mycologist worked for a short time at Bhagalpur, but before the end of the year returned to Pusa to do further work under the Imperial experts. They will return to Bhagalpur as soon as the Economic Botanist is in a position to provide for their accommodation and to supervise their work. Four of the Sibpur students sent to Cornell University for scientific and practical training returned in December; one of them was transferred to Eastern Bengal, the other three are at present under training at Bhagalpur, one as Assistant to the Economic Botanist, another as Assistant to the Agricultural Professor, and the third has been placed in charge of the Home Farm.

3. *Organisation.*—The office of the Registrar of Co-operative Credit Societies has been made subordinate to that of the Director of Agriculture who has been gazetted Director of Co-operative Credit Societies. The Registrar has

been appointed as Assistant Director of Agriculture. Revised proposals for the creation of a Provincial and Subordinate Agricultural Service are still under the consideration of the Government of India. Babu Upendra Nath Sen, first grade Sub-Overseer of the Public Works Department, was appointed Superintendent of Well Borings in February last and was deputed to Cawnpur where he underwent two month's training under the Director of Agriculture, United Provinces. The work of training borers for the districts of the Patna and Bhagalpur Divisions has been taken in hand.

4. There is now a Divisional Agricultural Association in each Division. The inaugural meeting of the Bhagalpur Association was held in May. An account of the work of the District and Divisional Associations is given in a subsequent paragraph of this report.

5. The work of laying out and stocking the Agricultural Stations at Bankipore and Sabaur was completed during the year with the exception of the Overseer's quarters and inspection bungalow at Bankipore which are still under construction.

6. The land at Chinsurah for an Agricultural Station representative of the deltaic alluvium was completed and temporary sheds for working the land were put up. The permanent buildings will be undertaken next cold weather. The land has been fenced, roads constructed, and thirty pairs of bullocks purchased.

7. Mr. D. N. Mookherji visited the districts of Bankura, Birbhum and Midnapore and inspected the sites suggested by the Collectors and others as suitable for an Agricultural Station representative of the laterite area. A piece of land in the neighbourhood of the Kharagpur Railway Station in the Midnapore district was finally chosen. The land is at present the property of Government, but an application has been made to transfer an area of 200 acres to the Agricultural Department. It is not proposed to interfere with the temporary tenants who are cultivating this land until next year.

8. Mr. Smith visited Ranchi in February and chose a site in the neighbourhood for an Agricultural Station representative of the Chota Nagpur plateau. The site has since been inspected and approved by the Inspector-General of Agriculture and steps will be taken to acquire the land.

9. With the approval of His Honour the Lieutenant-Governor a demonstration farm has been opened at Kalimpong in the district of Darjeeling. This farm, which consists of about 70 acres, will be worked by the St. Andrews Colonial Homes, who will receive a grant of Rs. 5,000 per annum for five years for its maintenance. The demonstration work will be guided by the Deputy Director of Agriculture. Necessary buildings, roads, etc., were completed and the farm is now ready for demonstration.

10. Fifty acres of land at Frasergunge have been handed over to the Agricultural Department for the establishment of a special demonstration farm. The land has been embanked and a crop of rice will be taken off it this year. It will be some time before the earth is sweet enough for proper demonstration. This work has been carried on under the direct supervision of the Settlement Officer in the Sunderbans.

11. The Tassar Farm at Chaibassa and the two special jute seed farms at Berhampore and Purnea were maintained during the year.

12. *Tours.*—The Hon'ble Mr. Oldham was on tour for 36 days and I was on tour for 117 days. Mr. Oldham visited several of the Agricultural Stations, also Frasergunge, Muzaffarpur, Dooriah and Sirsiah. I paid 5 visits to Bankipore, 4 to Sabaur, 2 to Cuttack, 2 to Chaibassa, 3 to Burdwan and 1 to Dumraon. During my tours, I also visited the Indigo Research Station at Sirsiah twice, inspected the silk work at Berhampore twice, and also inspected the Tassar Farm at Chaibassa, the Cotton Farm at Chakradharpur and the Demonstration Farm at Frasergunge.

13. The Deputy Director visited each of the principal Agricultural Stations on an average once a month. He also attended several agricultural shows, including Sonepur, where he purchased cattle for the Chinsurah Station. Mr. H. H. Corbin visited several of the Agricultural Stations, the Government Cinchona Plantation at Mungpo and the Sonepur Fair. Mr. N. N. Banerjei attended the Bankipore and Diamond Harbour Exhibitions and the

meetings of the Agricultural Associations of the Presidency and Bhagalpur Divisions. All Shows of any importance were attended by the Agricultural Inspectors.

14. *Miscellaneous work.*—During the year arrangements were made for carrying out a Wage Census in August 1908. The statistics of wages of skilled and unskilled labour furnished in the fortnightly returns were found to be unreliable and the method of collecting them was found to be defective. Government has ordered the present system to be discontinued and a quinquennial investigation to be made by the Director of Agriculture on the lines of the scheme drawn up by Mr. Moreland, Director of Land Records and Agriculture, United Provinces of Agra and Oudh. The Director of Agriculture, Bengal, visited Lucknow to consult Mr. Moreland, and thereafter with the permission of Government called together in Calcutta one officer chosen to supervise the work from each district. The objects and methods of the enquiry were explained and difficulties removed. In addition to the collection of statistics by officers, a list of non-official correspondents has been drawn up and instructions and forms have been forwarded to them with the request that they will fill these in to enable the Director to check his returns.

15. The agricultural survey of the varieties of wheat grown in this Province was commenced by Mr. N. N. Banerjei in 1906 and was completed by Mr. D. N. Mookherji during the year. The results of the survey have been published as Departmental Record No. 2. The results of Mr. Mookherji's soil survey have not yet been published but will be ready shortly.

16. During the year, a list of local names of varieties and races of sugarcane was published and circulated to all Agricultural Associations. A statement showing the normal areas under the principal crops in each district and the percentage of these areas to the normal net cropped area of the district was issued for the use of the local officers.

17. The Annual Season and Crop Report for 1907-08 was prepared as usual and submitted on the 1st of June 1908. The annual statistics of crops and areas were also prepared. The usual Preliminary and Final Forecasts of the various staple crops, the Weekly Weather and Crop Reports, the Fortnightly Reports of Wholesale and Retail Prices-current, the annual table of the average wholesale prices and the numerous tables and charts regarding the rainfall statistics were prepared and issued as usual.

18. Under the orders of the Government of Bengal, the publication of a Quarterly Journal of Agriculture in English was undertaken and four issues were published during the year. The Journal is used as a means of making known to the members of the Agricultural Associations and to the public generally what is being done by the Department. It contains articles on agriculture, sericulture, veterinary science, the results of successful experiments with various crops and manures and other matters considered of sufficient interest to those for whom the Journal is intended.

19. Messrs. Smith, Corbin, Woodhouse, Taylor, and the Director attended the fourth annual meeting of the Board of Agriculture held at Pusa from the 12th to the 17th February 1908. The Director also attended the Veterinar Conference which was held in Calcutta from 10th to 12th February 1908.

CHAPTER II.

Special Enquiry and Experiment.

20. *Aman Paddy.*—The Dewan of the Burdwan Raj and Rai Lalit Mohan Singh, Raja Bahadur of Chakdighi have, during the last few years, distributed to selected *raiyats* in Burdwan, Hooghly and Birbhum bonemeal and saltpetre for trial as a manure for the paddy crop, which was found so very successful at Burdwan. Mr. D. N. Mookherji, who was specially deputed to collect the results of this year's demonstration, reported that owing to the failure of the monsoon, the demonstration had not been successful. In the early part of the year, the manured fields promised better than the others, but before the harvesting season the whole crop was burnt up and Mr. Mookherji's investigations tended to show that the drought affected the manured fields more severely than the unmanured fields.

21. *Cultivation of Jute.*—The jute experiments which are being carried out at the Burdwan Agricultural Station on the lines indicated by the Inspector-General of Agriculture were continued, but were confined to the ten best varieties out of the 56 grown in previous years. The plots manured with cowdung gave the largest outturn. Those manured with castor-cake stood next, but the difference was nominal. The experiments on cutting at different stages proved that the longer the crop is allowed to grow the heavier the yield of fibre, and there was very little difference in the quality of the fibre cut at different stages of growth. So far as varieties are concerned, all ten proved very good in respect of outturn and of quality. In the spacing experiments, thinning out the plants to 4 inches apart again proved to be the best practice. The system of sowing with drills does not appear to be better than that of broadcasting.

Experiments were also conducted at the Cuttack Station. Both the soil and the sub-soil here are very poor in nitrogen, phosphoric acid, potash and lime, and experiments were therefore made of applying in addition to the cowdung, superphoshate, sulphate of ammonia, sulphate of magnesia, saltpetre, kainit and lime in different combinations. The plot treated with 100 maunds of cowdung, 4 maunds of superphosphate, 3 maunds of kainit and 2 maunds of sulphate of ammonia and magnesia each per acre added with lime gave the best outturn. This experiment will have to be continued for some years before reliable conclusions can be drawn.

The results of jute experiments have been published in a special leaflet both in English and in the vernacular, and these have been distributed largely throughout the jute growing districts of this Province.

22. In the previous year, the Provincial Agricultural Association supported four jute seed farms. It was found difficult, however, to supervise the work properly in so many farms and two of them were accordingly abandoned. The farms at Purnea and Berhampur are equipped with bullocks, ploughs and sheds, etc., so that the Overseer can work independently of local assistance. The Deputy Director concentrated his attention on these two farms and obtained from the 53 acres under cultivation 230 maunds of jute seed of the very best quality an outturn moreover which was nearly as much as was obtained in previous years from 100 acres. The Provincial Association decided in December last to retain these two jute seed farms for another year, after which the question of growing jute seed at the different Agricultural Stations will be considered.

23. An attempt was made by the Association to grow jute at Frasergunge in the Sunderbans. *Deswal* seed was sown on an area of 30 acres in three separate plots, but unfortunately the *bunds* gave way and the salt-water prevented germination. The experiment was continued for another year, and it has just been reported that although the *bunds* did not fail, the land is not yet sweet enough to grow a jute crop.

24. The low price of jute and the high price of food-grains together with the unfavourable weather has discouraged the Indigo planters in North Bihar from continuing their experiments, and there was a considerable decrease in the area sown by them this year.

25. Jute was grown with success at the Kalimpong Demonstration Farm on a small patch of land and the report of the fibre was excellent in every way except that it was said to be brittle.

26. *Cotton Cultivation.*—The small area of 5 acres taken up at Chakradharpur for cotton cultivation referred to in paragraph 25 of last year's report proved a failure as the land was not suitable. The plant to plant selection and the experiments have been transferred to the Tassar Farm at Chaibassa 12 miles away.

27. *Cultivation of Central Provinces Fine Aus Paddy.*—During the year fine *aus* paddy seed obtained from Nagpur and Sambalpur was freely distributed throughout the Province, but the crop failed in most cases owing to the failure of the monsoon. Good results were obtained, however, in isolated instances in the districts of Palamau and Manbhum in the Chota Nagpur Division and in the disrict of Cuttack where irrigation was available. The highest yield, namely, 30 maunds per acre was obtained by Munshi Nawrang Lal Mukhtar, a member of the Palamau District Agricultural Association. Raja B. L. Singh of Hariharpur, Manbhum, obtained 27 maunds per acre, and the Sub-Manager of Killa Kujong in Cuttack obtained 20 maunds. There is

little doubt that this variety of *aus* paddy will do well in many parts of the Province, provided the rains are seasonable. Seed has again been distributed during the current year.

28. *Cultivation of Flax.*—The work of Mr. E. Vandekerkhove, the Belgian Flax Expert, referred to in paragraph 29 of last year's report proved very encouraging, and it has been decided with the approval of the Inspector-General of Agriculture to retain the expert's services for five years, the Imperial Department meeting one-half of his salary, the Provincial Department the other half, and the proprietors of the Dooriah Concern meeting all other expenses.

A review of Mr. Vandekerkhove's report on the results of his year's experiment was published in the Quarterly Journal and is appended (Appendix II) to this report for the information of those interested in flax cultivation.

29. *China Cabbage.*—Babu Troilakhya Nath Chatterji, of Ghatbogh, in the district of Khulna, obtained an outturn of 350 maunds per acre and in Cuttack Mr. Bremner, the Superintending Engineer, Irrigation Branch, obtained succcessful results. He estimated the value of the outturn at Rs. 200 per acre.

30. *Other Crops.*—Different kinds of vegetables, sunflower, sugarcane and tobacco were successfully grown at. Frasergunge. The rubber (*Ficus Elastica*), cocoanut, plantain and other trees planted out on the highest portion of the island have done remarkably well. The cocoanut trees, however, were attacked by the rhinoceros beetle. *Dharwar* and *Buri* cotton were successfully grown in Angul and in some parts of Balasore.

31. *Agricultural Stations.*—Under the orders of Government, a short account of the administration of each of the Agricultural Stations is given in Appendix No. III. The annual report of each station, containing a scientific record, is being prepared and will be published separately as usual. In the previous chapter, a short account has been given of the progress made in the establishment of new stations. Those at Bankipore and Sabaur are practically complete At Chinsurah, the land is being got into order and the plans and estimates for the buildings are ready. An opportunity arose of obtaining a site representative of the laterite area which stretches across the districts of Midnapore, Bankura and Birbhum without expense to the Government and proposals have been submitted for demarcating the land. A site has also been selected near Ranchi for a Station representative of the peculiar agricultural conditions of the Chota Nagpur plateau. It has been decided that the Department should have a station near Ranchi, and as it is probable that land values will increase rapidly as the town develops, it has been thought advisable to apply for the acquisition of the land at once. These will complete the requirements of the Province in respect of Agricultural Stations comtemplated in the scheme for the development of the Agricultural Department, but it will not be possible for some time to put the stations at Kharagpur and Ranchi into full working order.

CHAPTER III.

Agricultural Experiments in Government, Wards' and Private Estates.

32. The failure of the monsoon affected very materially the *rabi* and *bhadoi* crops.

33. *Potatoes.*—The Naini Tal variety was tried in several places, but owing to the unfavourable weather resulted in failure in many cases. In the Wards' Estates in Midnapore and Hazaribagh, however, some success was obtained. The Patna variety did well in the district of Angul. It was tried with success by some of the Khas Mahal tenants in Balasore and by Syed Waizuddin Mukhtar, in the district of Palamau.

34. *Wheat.*—Mr. Mylne of Behea, in Shahabad, and Babu Jnanendra Mohan Dutt, of Muzaffarpur, were successful with the Muzaffarnagar variety of wheat and the crop obtained from this seed was watched with much

interest by the tenants in the Kolabaria Wards' Estate in the district of Sambalpur. Buxar wheat was successfully grown at Angul and in the Lugma Wards' Estate in the district of Bhagalpur.

35. *Groundnuts.*—This crop seems to have a considerable future before it, especially in Orissa where the land is poor, and an addition to the food-stock of the country would be a great boon. Raja Baikantha Nath De Bahadur and the Dewan of Borasambar in Balasore and Sambalpur have cultivated the crop with success. Babu Purnendu Narayan Singh, Secretary to the Patna Divisional Agricultural Association, and Babu Poran Chandra Pal in Bankura obtained good results. The crop was destroyed by rats in Khulna, Bhagalpur and Shahabad. Experiments at Frasergunge in the Sunderbans were hopeful.

36. *Jaunpur Maize.*—Captain Rutherford cultivated this variety with success at Ramkola in Saran and obtained an outturn of 20 to 30 maunds per acre. Mr. Mylne of Behea and Babu Hari Narayan Sinha of Shahpur also found from their experiments that this variety was good.

37 *Mustard.*—The Raipur, Cawnpur, Jabbalpur and China varieties of mustard were tried in various districts, but they all failed from lack of moisture.

CHAPTER IV.

Agricultural Education.

38. *Agricultural classes at Sibpur.*—At the beginning of the year, there were 10 students in each of the classes. At the annual examination held in November 1907, 7 of the 10 students of the second-year class obtained diplomas and all 13 students of the first-year class were promoted to the second year. No students were admitted this year into the first-year class, as it has been decided that the agricultural classes will be closed from November 1908 and will be transferred to the Provincial Agricultural College. The first student in the order of merit was appointed as a Deputy Collector and the second as a Sub-Deputy Collector. Of the other seven one has received an appointment in the Education Department as a teacher of science.

39. *Agricultural classes attached to Ravenshaw College.*—The new syllabus framed by the Hon'ble Mr. C. A. Oldham was introduced during the year. The classes are held two days a week from 4 P.M. to 5 P.M., and the students were taken to the Cuttack Agricultural Station on Saturdays for practical instruction. On the 31st March 1908, there were 68 students in the first-year class and 7 in the second-year, compared with 40 and 27, respectively, in the previous year. The attendance of the students, however, was irregular and few of them appear to take the teaching seriously.

40. *Agricultural classes at the Gaya Zilla School.*—Agriculture was taught in all classes, except the lowest, and out of 224 boys on the school roll 211 attended the lectures and 187 the practical demonstrations. The attendance was fair throughout the year and boys from other schools were attracted by the instruction. The course followed in the first and second-year classes was remodelled on the lines of the Hon'ble Mr. Oldham's syllabus. The practical classes were conducted in the school garden.

41. *Agricultural classes in the Dumraon High School.*—The Hon'ble Mr. Oldham's syllabus is taught in the first four classes, and in the fifth and sixth classes such instruction is given as is contained in their respective Science Primers. The number of students was 66 and the attendance was fair. The total number of higher class students doing practical work was 28 and that of the lower class 35. Practical work was done for an hour after school hours, a piece of land being set apart for the purpose and the students were taken once a month to the Agricultural Station.

42. *Agricultural classes in the Hazaribagh Zilla School.*—The Farm Superintendent of the Hazaribagh Reformatory School continued to give instruction in agriculture. The number of students attending the first class was 16 and the second class 20.

43. *Agricultural classes at the Burdwan Municipal School.*—The number of classes was reduced to 2 in accordance with the Hon'ble Mr. Oldham's suggestion and the syllabus prescribed by him was followed. In the first-year class, there were 12 students and 7 in the second. The botanical portion was illustrated by pot culture. Students were taken several times to the Agricultural Station and the work was explained to them. The school requires a garden.

44. These classes were sanctioned for a period of five years, and it is understood that the Education Department have submitted proposals for maintaining them permanently.

45. *Deputation of Students for agricultural training in America.*—Two of the Sibpur College students were sent to the Cornell University for further scientific and practical training. The four students sent to America in 1905 returned in December 1907. The services of one of these students were placed at the disposal of the Government of Eastern Bengal and Assam; the other three have been employed by the Department at the Provincial Agricultural College, Mr. H. L. Dutt as Superintendent of the Home Farm, Mr. A. C. Ghose as Assistant to the Economic Botanist and Mr. S. N. Sil as Assistant to the Professor of Agriculture. Favourable reports continue to be received of the four students who are still in America.

46. *Deputation of Students to the Pusa Institute.*—No student was sent to Pusa for special training during the year, but two scholarships of Rs. 30 per mensem tenable for two years at the Pusa College have been sanctioned and to one of these a distinguished graduate of the Calcutta University has been appointed.

47. *Practical training of the sons of cultivators.*—The class for student cultivators at the Cuttack Station was continued. At the beginning of the year there were 7 student cultivators and 6 more have since joined. Two of these were sent by the District Board of Balasore to be taught how to wash and prepare jute. Two students have obtained private employment, one under an European gentleman at Rajshahi and the other under the Raja of Barsambar in Sambalpur. Two students have been employed by Government, one in the Banki Government Estate and the other at the Chinsurah Agricultural Station. There at present 6 students in the class.

CHAPTER V.

Sericulture.

48. In accordance with the scheme recommended by the Special Committee appointed to enquire into the condition of the Silk Industry, Babu Apurba Coomar Ghosh has been appointed Superintendent of Sericulture with effect from the 1st of April 1908. Babu Apurba Coomar Ghosh was trained in scientific methods of sericulture by the late Mr. N. G. Mookherji, and he served for several years as Superintendent under the Bengal Silk Committee. The sericultural work will be carried out under the guidance of a Managing Committee, consisting of the Director of Agriculture as President, the Collector of Murshidabad, the Manager of Messrs. Louis Payen & Co., Mr. J. G. Malcolm and Babu Bhupati Lal Gooye. A suitable plot of land has been obtained from the Khas Mahal Department and 60 acres of mulberry have been planted out. Plans and estimates have been prepared for the Central Nursery and five subsidiary nurseries and the work will be carried out next cold weather.

49. During the first nine months of the year when the work was in the hands of the Bengal Silk Committee, there was a further extension of mulberry cultivation in the district of Bogra and some cultivators took to rearing worms. The work in the district of Malda and Rajshahi also progressed well. Mr. T. F. Morton, Manager of Ganatia, who takes a keen interest in sericulture, is pushing forward improved methods in Birbhum. The nursery at Rammati and those in Murshidabad have worked satisfactorily, most of them at a profit. Excellent seed was distributed from these to the local rearers and also to the rearers of other districts. Practical training was given to students at the Babulbona Nursery in Berhampore.

50. The experiments conducted by Babu A. C. Ghosh in connection with the cold storage of seed cocoons have been successful. *Nistri (Bombyx Crœssi)* and *deshi (Bombyx Fortunatus)* seed cocoons were sent in large numbers to the cold storage in Calcutta and the percentage of disease specially pebrine was thereby reduced.

51. The Sericultural School at Sabang in the district of Midnapore, which was started in 1903, continues to do some useful work. The District Board at present supports it with a grant of Rs. 30 per mensem. The Government has also sanctioned, at the request of the Director, the creation of four scholarships of Rs. 5 per mensem and the purchase of a new microscope for the use of the new school. In connection with the general scheme for the improvement of the Silk Industry, two rearing houses will be set up in Midnapore as soon as funds permit.

CHAPTER VI.

Publication of Agricultural Information and Supply of Seeds, Manures and Implements.

52. The Seed Store of this Department supplied during the year 1,000 maunds of seeds of various kinds, 429 maunds of manure and a large quantity of sugarcane and Cassava cuttings. Jute, *aus* paddy and *buri* cotton seed were largely distributed and also bonemeal, saltpetre and superphosphate. Potatoes were supplied to applicants through dealers.

53. The following leaflets were prepared and vernacular translations of all except No. 5 were widely circulated:—

(1) Conservation of farm yard manure.
(2) Ensilage for fodder.
(3) Weeds and their suppression.
(4) Bonemeal and saltpetre as a manure for paddy.
(5) Short note on the cultivation of Mangel Wurzel.
(6) Cassava.
(7) Short instructions for the improvement of cotton by plant to plant selection.
(8) Jute experiments in Bengal in 1907.
(9) Oats.
(10) Wheat.
(11) List of crops recommended for cultivation.
(12) The Bengal seed, manure and implement store.

54. A statement showing the normal areas under the principal crops in each district and the percentage of these areas to the normal net cropped area of the district, a list of local names of varieties and races of sugarcane grown in Bengal, a short survey of the wheats of Bengal, by Mr. D. N. Mookherji, and the Quarterly Journal of this Department, were published and distributed during the year. Reports on the several Agricultural Stations were published and distributed as usual.

CHAPTER VII.

Agricultural Associations and Agricultural Shows.

55. *Provincial Agricultural Association.*—The most important matter which came before the Association this year was the establishment of close relations between the Agricultural Associations and the Civil Veterinary Department, a subject brought forward by the Patna Divisional Association. In accordance with the recommendation of the Provincial Association, the

Superintendent of the Civil Veterinary Department has been made an ex-officio member of each of the Divisional Agricultural Associations and all District Associations send to him lists of their members and notices of their meetings, so that he can come into personal contact with the members while on tour. Books of telegraph forms have been distributed to the Associations, so that members can telegraph information concerning outbreaks of infectious diseases direct to the Superintendent.

The work of the Provincial Association in connection with the production of good jute seed has already been referred to and a detailed account will be found in Appendix No. 1.

56. *Divisional and District Agricultural Associations.*—A grant of Rs. 1,000 was made as in previous years to the Associations in each Division. The distribution of the grant is in the hands of the President of the Divisional Association. The Patna and Orissa Divisional Associations continue to do good work and the Burdwan Association made great strides under its able President, Mr. S. L. Maddox, a former Director of this Department. The Bhagalpur Association which was recently inaugurated promises to do well.

The work of several members of the different Associations deserves special mention. Rai Lalit Mohan Singh Raya Bahadur of Chakdighi continued to take a keen interest in the development of Agriculture in his own estate in Burdwan. Babu Amrita Lal Seal showed enthusiasm in the cultivation of sugarcane in the same district. Babu Rakhal Das Chatterjee did good work with the Central Province *aus* paddy in Bankura. The Bankura Association distributed free of charge and at cost price improved varieties of seed, manures and agricultural implements. The Subdivisioual Officer of Contai and the Mohunt of Chandrakona in Midnapore gave much attention to the growing of maize, paddy, jute, sugarcane, tree cotton and wheat. The members of the District Associations of the 24-Parganas, Murshidabad and Khulna took a practical interest in the work. Rai Kali Bhusan Ghose Bahadur, Babu Jotindra Nath Bose and Babu Upendra Nath Purkait in the 24-Parganas, Babu Trilakhya Nath Chatterjee of Ghatbhog, Babu Jotindra Nath Bose, of the Syedpur Trust Estate, Babu Indu Sekhar Mukherji of Satkhira in the Khulna district, also interested themselves in agricultural work. Babu Nafar Das Roy in Murshidabad made an experiment with ensilaging. Mr. Mylne of Belsea, Babu Harihar Prosad Singh of Dumraon, Babu Hari Narayan Sinha of Shahpurpatti, Mr. Solano of Arwal, Captain Rutherford of Ramkola Factory, Babu Gnanendra Mohan Dutta of Muzaffarpur, and Chaudhuri Raghunandan Singh of Silout have been specially commended for the work done by them during the year. Mr. Woodman, Collector of Muzaffarpur, and Mr. Moberly, Deputy Commissioner of Sambalpur, took a keen practical interest in the improvement of agriculture within their districts. The Patna Divisional Association procured the services of an expert jute cultivator from the Burdwan Station and distributed seed to its members with a view to popularizing jute cultivation in South Behar. This Association engaged the services of an intelligent cultivator to tour through the districts and introduce improved methods of cultivation among the *raiyyats*. Babu Purnendu Narayan Singh, Secretary to the Divisional Agricultural Association, Patna, deserves great credit for his work. Various members of the Orissa Associations took up pieces of demonstration work particularly with a view to introduce the cultivation of ground-nuts in their districts. Raja Boikantha Nath De Bahadur, of Balasore, demonstrated the value of growing winter crops in rotation with jute, and Babu Radha Charan Das carried out some successful work in connection with tobacco and vegetables. The Angul District Association took up the question of the improvement of the breed of cattle and purchased three good bulls, which are being kept for the use of the *raiyyats* at the Angul farm. In the Chota Nagpur Division, the cultivation of potatoes has been spread successfully in Hazaribagh, Ranchi and Palamau. In the last-mentioned district, the Rev. Father Grosjean did some good work.

57. *Agricultural Shows and Fairs.*—The Travelling Inspectors of the Department attended all the shows and fairs of any importance and demonstrated the uses of various implements and the value of various seeds and

manures. They also distributed the leaflets referred to above. Grants-in-aid amounting to Rs. 7,050, were given to these shows. The Deputy Director and the Personal Assistant were present at all the more important shows and fairs. A brief account of each show will be found in Appendix No. IV.

CHAPTER VIII.

MISCELLANEOUS.

58. *Crop-cutting experiments.*—The report on the results of the crop-cutting experiments carried out during the five years 1902-03 to 1906-07 was submitted to the Board of Revenue with this office letter No. 6882-A., dated the 28th November 1907. The number of experimental cuttings accepted during the quinquennium was 4,111 as compared with 3,294 in the preceding quinquennium. The results of some 500 experiments were rejected as unreliable. There is still room for improvement in connection with these experiments.

59. *Entomology and Mycology.*—Flights of locusts appeared in the Districts of Gaya, Shahabad, Saran, Champaran and Muzaffarpur, but the damage done to the standing crops was slight except in the Raghunathpur thana and in the Barharia outpost in the Saran district where the estimated loss in maize, *arhar* and cotton was 6 annas. Locusts visited also parts of Burdwan, Monghyr, Bhagalpur and Sonthal Parganas districts, but did little damage. Insect pests caused some damage in the Aurangabad Subdivision of the Gaya district. In Saran, white ants damaged sugarcane. The Commissioner of the Bhagalpur Division has reported that in June last considerable damage was done to the autumn rice crop by caterpillars in the Sadar Subdivision of the Purnea district. Caterpillars injured the jute crop in the Singti and Amta police-stations in Howrah.

60. The staff at the disposal of the Department is not sufficient to cope with these pests in the field. We have at present one Entomological and one Mycological Assistant, and where outbreaks have occurred they have visited the spot and reported the results of their enquiries to the Imperial experts. Both Assistants have their head-quarters at the Imperial Research Station at Pusa where they are doing useful work under these experts.

61. *Indigo.*—The Government grant of Rs. 50,000 to the Bihar Indigo Planters' Association for research work in indigo was continued during the year. This staff was also employed at the Sirsiah Research Station. Mr. Turnbull however, the Botanist, resigned on the 15th December 1907 on account of ill-health and his place has not yet been filled. Mr. Macgregor was on sick leave from the 15th October 1907 to 10th January 1908. Mr. W. H. Smith acted for him. Mr. Bergtheil was on leave for three months when Mr. Briggs remained in charge. The staff did good work for which they received the thanks of the Association. The Advisory Committee, which was strengthened by the addition of another planter, met regularly once a month during the year and the average attendance was 82 per cent. The following reports and notes were published by the Committee during the year:—

(1) Treatment of Java Natal seed with concentrated sulphuric acid.

(2) Third Annual Report of the Sirsiah Committee.

(3) Report of the Indigo Research Station, Sirsiah, for the year 1907-08.

(4) Recommendation of the Sirsiah Committee regarding the future of Java seed supply for Bihar.

(5) Minutes of proceedings of the Sirsiah Committee meetings.

The three special farms for the Java Natal plant were continued as before; only 506 maunds of seed were produced against 1,986 maunds in the previous year. Owing to the dryness of the season, the outturn at the Rajpur farm in

Champaran and at the Purtabpur farm in Saran was only one-sixth of the estimate, and the whole of the seed of the Dowlutpur farm was destroyed by a fungoid disease which is under investigation by the Pusa experts. On the advice of the Committee these seed farms have been abolished from the current year, and it has been arranged that the members of the Association will henceforth grow their own seed and arrange a system of mutual exchange. Every endeavour will be made to select the strongest and healthiest plants for seed purposes. The Sumatrana Seed Farm at Dasna in the United Provinces, under the management of Mr. R. E. Flavell, produced 1,512 maunds against 2,462 maunds last year. A short account of the scientific work carried out during the year will be found in Appendix No. V. Mr. Bergtheil and his assistants are again to be congratulated. Mr. T. R. Filgate, General Secretary of the Bihar Planters' Association, has guided the work of this Research Station with his usual tact and ability. The station was visited during the year by His Honour the Lieutenant-Governor, the Hon'ble Mr. R. T. Greer, C.S.I., and the Inspector-General of Agriculture in India.

62. *Sugar.*—Mr. Percy Jones of Benipur Factory in the Darbhanga district continued during the year to experiment with the cane-crushing mill and *rab*-making appliances. Mr. Jones reports that he worked the system at a profit of Rs. 2,365 and he expects an increased profit this year.

63. *Arboriculture.*—A class lasting for one month was opened on the 12th of August 1907 at the Royal Botanic Garden, Sibpur, for the training of Overseers, Sub-overseers and other subordinates of District Boards in Arboriculture; 29 officers attended the course and all but eight districts were represented. A similar course will be given this year.

64. *Well-boring Operations.*—A scheme for the extension of well irrigation in Bihar was sanctioned in Government Order No. 145T.R., dated the 19th April 1907, but the scheme could not be put into effect immediately owing to the difficulty in procuring the services of a suitable Superintendent. Eventually Babu Upendra Nath Sen, a Sub-overseer of the Public Works Department, was appointed Superintendent of well-boring and was deputed to Cawnpore for training. He returned on the 8th of April 1908, and for the present his head-quarters have been fixed at Bankipore where he is employed in training 12 borers, one for each district of the Bhagalpur and Patna Divisions. As soon as the borers are properly trained each will be entrusted with a complete set of boring tools and his services will be placed under the Collector. Meanwhile programmes of work, to ensure the best use being made of their services, will be drawn up by the Director in consultation with District Officers. The Superintendent has made trial borings at Sabaur, Bankipore and Pusa.

65. *Sida Rhombifolia Fibre.*—A specimen of this fibre submitted by Babu Jagadindra Deb Raikut, of Jalpaiguri, was sent to the Imperial Institute, London, for appraisement. Professor Dunstan has reported that the fibre was of excellent quality, compared favourably with extra fine quality of Indian jute and could be utilised as a substitute for this fibre. The commercial experts in England, to whom the fibre was sent, described it as a beautiful specimen of fine silky well-grown fibre, very white in colour, free of root, strong and well-prepared, which could probably be used for mixing with silk. They stated that if the fibre were employed for the finest purposes to which jute is applied it would sell in large quantities at from £25 to £30 per ton.

66. *Lac Dye Liquor.*—An analysis of this waste product of the lac factories was kindly undertaken by the Imperial Agricultural Chemist, who has reported that the liquor will be useful as a manure if applied to the land before the season of sowing.

67. *Rainfall Stations.*—Three new stations were opened during the year at Palhet in Midnapore, at Jankhia and at Tanghi in Puri. Sixteen stations in Midnapore and three in Darbhanga were sanctioned towards the end of the year and statistics for these will be recorded during the current year. The station at Barkope in the Sonthal Parganas was removed to Pooryea and placed in charge of the Sub-Inspector of Police. The station at Garhbet, in Midnapore, has been removed to a more suitable site at Amlagora. The station at Pipli, in Puri, was closed as the Irrigation Department had a station in the vicinity and a new station was opened at Sonakhalla.

68. The following table shows the distribution of the 312 rainfall stations in various districts in Bengal as they stood on the 30th June 1908 and

the number of stations inspected in each district during the past year so far as inspection reports were received by this Department.

District.	Number of raingauge stations.	Number of raingauge stations inspected.	District.	Number of raingauge stations.	Number of raingauge stations inspected.
Burdwan ...	5	...	Monghyr	10	3
Birbhum ...	6	...	Bhagalpur ...	8	...
Bankura ...	10	8	Darjeeling ...	6	...
Midnapore ...	11	6	Purnea	7	1
Hooghly ...	3	3	Sonthal Parganas ...	21	1
Howrah ...	4	2	Sambalpur ...	3	3
24-Parganas ...	9	2	Uria Feudatory States	7	...
Nadia ...	5	3	Cuttack	8	...
Murshidabad ...	10	3	Balasore	10	...
Jessore ...	5	4	Angul	5	2
Khulna ...	12	6	Orissa Tributary Mahals	18	3
Patna ...	8	...	Puri	9	2
Gaya ...	11	1	Hazaribagh ...	8	1
Shahabad ...	13	7	Ranchi	10	2
Saran ...	10	...	Palamau	16	1
Champaran ...	8	...	Manbhum ...	9	1
Muzaffarpur ...	7	1	Singbhum ...	12	10
Darbhanga ...	8	4			

69. *Agricultural Museums.*—The only Agricultural Museum in the Province is at Dumraon. It contains a small collection of seeds, implements, etc., and is maintained by the Dumraon Raj. Steps are being taken to collect specimens for the Museum which it is proposed to establish in connection with the Sabaur College.

70. *Agricultural Implements.*—The usual list of implements tried in the Province during the year is given in Appendix No. VI. During the year 95 implements were issued from the Departmental Seed Store. Messrs. Thomson and Mylne sold 348 of their well-known Behea sugarcane-crushing mills. Messrs. Burn and Company sold 12 sets of well-boring tools, 9 Abyssinian tube wells, 2 bullock gears and 2 paddy huskers besides some fibre decorticators and jute presses. Messrs. Jessop and Company sold the largest number of implements, the principal being 120 Hindustan ploughs, 36 chaff-cutters, 43 corn crushers, 12 Donaldson oil mills, 6 Aporcadores ploughs, 5 Hindustan cultivators, and 2 rice hullers.

71. *Officers of the Department.*—Mr. F. Smith, B. Sc., Deputy Director of Agriculture, has shown his accustomed energy and enthusiasm in inspecting the various stations under his charge. He visited all the more important stations on an average once a month. The Personal Assistant, Mr. N. N. Banerji, B.A., M.R.A.C., deserves great credit for his work in connection with the Quarterly Journal, the editing of which was almost entirely in his hands. The sad death of Mr. W. R. Buttenshaw, who was appointed Economic Botanist to the Government of Bengal, has to be recorded. Mr. Buttenshaw arrived in Calcutta on the 7th of September and died two days later of heat apoplexy. Messrs. E. J. Woodhouse and C. S. Taylor have taken up with energy the organisation of temporary laboratories at Bhagalpur. The Department is indebted to the Imperial Officers at Pusa who have always been ready to assist with counsel and advice.

Before closing the Report, I may be permitted to refer to the work done by my predecessor. The labours of the Hon'ble Mr. C. E. A. W. Oldham, the organiser of this Department and its first Director, will not soon be forgotten and those who served under him while rejoicing in his promotion to the post of Financial Secretary to the Government could not but regret the great loss to the Agricultural Department. Personally, I have to thank the Hon'ble Mr. Oldham for the readiness with which he has at all times placed his experience at my disposal and the willingness with which he has helped me to acquire a knowledge of the work.

I have the honour to be,

SIR,

Your most obedient servant,

W. R. GOURLAY,

Offg. Director of Agriculture, Bengal.

APPENDICES.

APPENDIX I.

Jute Seed Farms in 1907.

The following short note shows to those interested in the jute crop what the Bengal Provincial Agricultural Association has done in 1907 to improve the stock of jute seed in our Province.

As will be remembered, this work was started in 1905 with the object of obtaining better seed than that obtainable from cultivators, who retain the weakest and most stunted plants in the field for this purpose.

In 1905, 12½ acres were devoted to this object at four centres, *viz.*, Gouripur (Mymensingh), Rangpur, Jalpaiguri and Rajbari (Faridpur), under the charge of one Jute Overseer, with the result that 27¾ maunds of good seed were obtained.

In 1906, 99½ acres were taken over for the same object, *viz.*, 30 acres at Purneah, 23 acres at Berhampur, 28 acres at Krishnagar and 18½ acres at Chinsura. An Overseer was put in charge at each farm, but we were dependent on neighbouring cultivators for labour and ploughs. The result of the year's work was that 268¼ maunds of jute seed were obtained for distribution, and the demand for this seed was so great that none was left after February 1907.

This year (1907) only 53 acres were taken at two centres, *viz.*, Berhampur and Purneah. An Overseer was put in charge at each farm, and he was given an establishment, with the requisite bullocks, to work the area to the best advantage. The results have justified our decision to work our farms independently of local help, for we have obtained 230 maunds of good seed for distribution, *i. e.*, almost the same quantity of seed as last year from half the area we rented in 1906. Orders will be booked as they come in for this amount at Rs. 15 per maund, or annas 6 per seer. Arrangements have been made to supply small as well as large quantities, and, to prevent delay or disappointment, purchasers are asked to kindly submit their indents as soon as possible. In the cold weather, seed can be stored with little chance of being damaged, and it would be well if those who live in outlying districts would remember that delay is very often caused during transit.

In 1905, seed was obtained in the best way possible—from our farms and through Messrs. Bird & Co., Ralli Bros. and the Subdivisional Officer of Serajganj.

In 1906, we used chiefly our own-grown seed, but we had to take a little from outside, as in 1905.

This year we used our own-grown seed entirely.

At Purneah, this year, we rented 30 acres, and 21·7 acres were put under the following varieties: Deswal of Serajganj (11 acres), Kakya Bombai of Serajganj (7·9 acres) and Hewti of Jalpaiguri (2·8 acres), and the following outturn of seed has been obtained, *viz.*: Deswal, 43 maunds; Kakya Bombai, 38¾ maunds and Hewti 20¾ maunds. A first-rate sample of seed has been obtained.

At Berhampur 23 acres were sown with Hewti (Rangpur), Deswal (Serajganj) and Satnala (Faridpur) varieties with the result that the following amounts of seed have been obtained, *viz.*: Hewti, 58 maunds; Deswal, 36 maunds and Satnala, 31½ maunds. The sample of seed is first-rate.

Accounts.

The following money has been spent at the Purneah and the Berhampur jute Seed Farms:—

Purneah—

	Rs.	A.	P.
Pay of the establishment from January to November 1907	1,162	2	6
Stock	538	8	3
Cultivation charges	1,068	6	6
Rent	56	8	9
Total ...	2,825	10	0

Berhampur—

	Rs.	A.	P.
Pay of the establishment from January to November 1907	1,163	5	2
Stock	741	1	6
Cultivation charges	1,217	9	3
Total ...	3,121	15	11

and the approval of these expenditures by this Association is required.

This meeting should decide whether these two farms will be continued or not in 1908. The idea of the new large Experimental Stations is that three-fourths of the area will be reserved for the production of good seed for distribution purposes. As Chinsura will not be ready in 1908 for this purpose, and as the other farms are outside the real jute-growing belt, we may keep our two farms for 1908 and give up one of them for 1909. Whether it be decided to do away with these special farms or not, the fact remains that the Bengal Provincial Agricultural Association has endeavoured to meet a real want—and a want that will be there so long as our Experimental Stations are not in full working order, or so long as Bengal has no *bonâfide* "seedsmen" to supply the cultivator with improved varieties of seed.

APPENDIX II.

A Review of a Report of Mr. E. Vandekerkhove, Flax Expert.

This crop has been grown experimentally for several years in Bihar. The chief experiments have been conducted at Dhooria. The cultivation of flax on this estate in 1906 and in 1907 was on an extensive commercial scale. The 1907 crop was grown under the direct supervision of Mr. Vandekerkhove, who is a practical flax expert. He was engaged for a year by the Indigo Planters' Association, helped by funds provided by the Bengal Government. Mr. Vandekerkhove's report on his year's work is reviewed as under.

Soil and season.—The value of a flax crop is largely determined by the character of the soil and of the soil moisture. The best market rates can only be got if the stems are uniform in length, colour and flexibility. In Bihar the light sandy soils and the heaviest clay soils will not usually produce a crop of this quality. Soils intermediate between these two are generally best, but this depends upon seasonal conditions. If the Hastha or Hathyia rains in September-October are good, fairly light high land may be found suitable. If the October rainfall is deficient, low lying clay-like land may probably be best. The important point is that the land should hold sufficient moisture near the surface at the time of sowing to secure even germination.

Cultivation.—Flax can only be grown successfully in the *rabi* season. It can follow a monsoon crop which is taken early off the land if by ploughing and other tillage a clean friable seed bed for the flax is produced before the middle of October. It is unlikely that flax can be grown on the same field oftener than every fourth year. The land should be in good heart from previous manuring. Direct manuring for this crop is not advisable. European experience indicates that a liberal dressing to the previous crop of a general manure such as cattle-dung, indigo refuse (*seet*) or oilcake would give good results. This dressing should be at least 8 tons of cattle-dung or *seet* or half a ton of rape or castor-cake per acre (these are usually the cheapest manures in Bihar).

Seed.—There is no doubt that imported seed should be used in the first instance. Mr. Vandekerkhove considers that Russian seed acclimatised for one year in France, Belgium or Holland may give the best results. There is, however, clear evidence that Russian or Belgian seed imported direct gives good results, and that such seed acclimatised in India continues to give good results at least for some years. The seed acclimatized in India is smaller than that imported. A seed rate of 120 to 150 lbs. of imported seed, of 100 to 130 lbs. of acclimatized per acre is required when both kinds are of good germinating power. The seed should be sown in October or at latest in the first week of November. The seed may be broad-casted by hand or drilled like indigo in very narrow rows, and could probably be very expeditiously and successfully sown by the cheap broadcast sowing hand barrow which is so extensively used in sowing clover and grass seeds in England. It is best to sow in the early morning before the sun dries up the surface moisture. The seed should as far as possible be covered by light raking, afterwards the soil should be "rolled" down with a light log to conserve moisture. These operations are very essential to even germination on which success of the crop greatly depends.

Weeding.—The land should be so carefully tilled before sowing that little weeding will be required afterwards. Hand-weeding where necessary is essential. A bullock hoe cannot be used. The hand-weeding should be done when the seedlings are small. When the seedlings are three inches high it does more harm than good on account of the damage done by trampling. Clean seed should be sown to avoid as far as possible the need for weeding.

Maturing and harvesting.—Flax in Bihar is usually a four months' crop. It reaches maturity for fibre when the first seed bolls have fairly set. At this stage the amount of seed obtainable is small, but the quality of the fibre is superior. The usual signs of ripening are that the stems begin to get yellow, that the bottom leaves of the stems become yellow and begin to drop off, and that some of the bolls contain seeds which are beginning to get brown in colour. In an uneven field these signs may appear in patches. When they do appear the crop should be uprooted, patch by patch, immediately. The Indian coolie knows how to do this work because he is accustomed to it with other crops. The roots should be shaken free of earth and the stalks laid neatly in rows or "Swathe" and allowed to dry for two or three days. The crop should then be tied into small-sized sheaves. If possible, the coarse and fine, the long and short stalks should be tied in separate

sheaves. This helps in sorting the different qualities of fibre when it is being scutched. When sufficiently dry the crop should be carted to the threshing floor in order to separate the seed by beating the sheaves with sticks or by beating them against a hard floor. The seed can be cleaned by wind in the ordinary way. Only the best seeds should be kept for sowing. It can be safely stored in tins or closed earthenware *chatties*. It is necessary to protect the seed against weevils and absorption of moisture which cause great loss to the germinating power.

Quality.—The characteristics of good quality in flax are straight yellow slender stems, small white roots, very few branches and pods, small soft leaves which are far apart; stems flexible towards the root and 28 to 36 inches long between root and top. Any length less than 18 inches of unbranched stem is useless except for tow. Coarse fibre of low market value is got from flax which remains green too long, which branches out freely and from which the stem leaves do not drop off when matured. A variety with these characteristics yields seed freely. The characters referred to in this paragraph should be specially studied in seed selection.

Retting.—There are several systems adopted in Europe, *viz.*—

(1) River retting.
(2) Dew retting.
(3) Stagnant water or "blue" retting.
(4) Tank retting with under flowing water (Loppersium patent).
(5) Tank retting with washing system. (C. Vanstcenkiste patent).
[(4) and (5) are imitations of river retting.)]

The flax expert found (4) and (5) unsuitable to India and found it inconvenient to try the others. He decided that it was best to use ordinary indigo vats. The vats should be loaded with sheaves on end as evenly as possible; a second layer being placed above the first in the same way, and both kept in position by a close layer of bamboos on the top; cross beams 4 or 5 feet apart are rigidly kept in position about a foot above the loaded flax. Water is let in until the rising flax reaches the rigid beams. The water should cover the flax. The dissolving of the gums of the flax causes the water to become dark brown in colour. When the water becomes too heavy laden with dissolved matter the retting bacteria cannot live in it. Consequently the brown water is let out at the bottom of the vat. Fresh water is let in at the top until the effluent water becomes fairly clear. If this fresh water gets also brown in colour a portion may also have to be renewed before the first retting is complete. Generally coarse straw which is stained by being laid in the field can be retted quicker than straw of better quality. The warmer the water is the quicker the retting is accomplished. The best temperature is between 64° and 75° F. Water at 80° F. is not unsuitable, but at 90° F. is risky for good results. It takes six to ten days to ret the best quality of fibre. The process is considered complete when the bark and fibre layer cracks slightly by pressing the stem between the fingers. The water is then drained off and the flax is removed to the open to dry, great care being taken in handling it whilst wet to prevent damaging the tender fibre. When dry it is again brought to the vats and again loaded as before. When the water gets brown it is allowed to run off and clear water let in for a few hours until the retting is finished. The test is to break a stem in two places and draw out the fibre between these two points. If it comes out very easily the retting is complete.

The object of twice retting and once drying in between is to improve the quality and colour of the fibre by bleaching in the sun and exposure to the air. Retting is best done in Bihar in the cold season as the temperature of the water is then usually just right.

Drying.—The sheaves of flax are now removed to an open space, preferably to grass land, to dry. Each sheaf is divided into two or three parts. Each part is bound at the top end and spread out at the bottom end and is set on the ground in the shape of a cone. These cones are turned inside out next day and again set up to dry, the whole object being to expose to the sun and air all the stems so that they may dry and bleach thoroughly. When completely dry the flax should be tied up into neat bundles keeping all the root ends as even as possible.

Breaking.—This consists in passing the flax in very even handfuls between two sets of fluted iron rollers. These break the woody part of the stem and do not damage the fibre. Breaking facilitates scutching.

Scutching.—A scutching machine can be worked by manual foot power or a number can be worked from a power shaft. The construction is difficult to describe; 8 or 10 hard wood blades about one-sixth inch thick fixed like the spokes of a cart wheel on a hub revolve at a high rate of speed on a shaft. In revolving they pass close to a hard wood board fixed in an upright position close to the revolving blades. In this board there is a slit. Through this slit the flax with a firm grip is passed in and withdrawn in handfuls—first one end of the handful and then the other. The process is repeated until the fibre is beaten clean. In scutching a considerable amount of tow is produced which has to be separated from the cleaned fibre. The cleaned fibre is graded according to quality, twisted and formed deftly into bundles. The scutching should be done before the flax becomes overdry and brittle. In Bihar the cold weather from November to 1st March is the best time. Mr. Vandekerkhove has been able to train ordinary coolies to do the work very expertly.

Baling.—The cleaned fibre is carefully graded according to quality. Each graded lot should be baled separately. This work requires expert knowledge. The bales for shipment are covered with gunny cloth and each should be distinctively marked to denote the quality of the fibre which it contains. The market rates vary largely. The very best qualities of flax always command very high prices.

Results of Dhooriah Experiments.—These indicate so far that flax is likely to become a paying crop on a commercial scale in Bihar. The net profit from an acre of flax is estimated as follows—

Outturn—

			Rs.	A.	P.
4 maunds of fibre at £ 50 a ton	...	...	111	1	5
1. 6 „ tow at £ 15 „	...	...	13	5	4
4 „ of seed at Rs. 4 per maund	...	...	16	0	0
Total		...	140	6	9

Deduct cost—

	Rs.	A.	P.			
1. Rent	2	8	0			
2. Cultivation	27	0	0			
3. Securing crop	4	11	8			
4. Preparing for retting	3	5	0			
5. Retting	3	2	10			
6. Scutching inclusive of tow ...	7	2	6			
7. Shipment	16	14	0			
8. Miscellaneous	1	4	0	66	0	0
Net profit			...	74	6	9

Future work.—The experimental results have been so encouraging that Mr. Vandekerkhove has been engaged for a term of years. The experimental work which has yet to be done covers a wide field. It will include the testing of (*a*) indigenous and exotic varieties, (*b*) acclimatization of improved seed, (*c*) plant to plant selection of seed, (*d*) soils, (*e*) rotation, (*f*) cultivation (*g*) manures (including its own *seet* water) and (*h*) retting methods. Demonstration will be made to show whether the crop can be produced profitably in other parts of India and is within the means of ordinary cultivators. The best methods of baling and marketing the crop will be further examined.

APPENDIX III.

Agricultural Stations, 1907-08.

Burdwan.—At this station the work on paddy, jute and potatoes commenced in previous years was continued. Full details will be found in the annual report. The latest results corroborate those already obtained, viz., that two crops, paddy and jute or potatoes and jute, can be grown on the same land in the same year. When the two crops are grown only one requires to be manured, viz., the jute crop in the rotation paddy after jute and the potato crop in the rotation potatoes after jute. In the case of such rotations, a good manure for jute is 135 maunds (5 tons) of cowdung and for potatoes either:

(1) 240 maunds cowdung,
(2) 22½ maunds castor-cake or
(3) 200 maunds cowdung, 3 maunds superphosphate and 3 maunds saltpetre per acre. These applications are recommended to the local cultivators.

When paddy is the only crop taken off the land, the following manurial applications have given the most economical results:—

(1) 3 maunds bonemeal and ¾ maund saltpetre, and
(2) 50 maunds cowdung.

Experiments to ascertain the best number of seedlings to plant per hole were continued during the year, and the results corroborate those of the preceding two years, viz., that planting one seedling per hole at a distance of 12 inches apart gives the best outturn. The experiments in green-manuring have shown that for *aman* paddy, green manuring with jute or with *dhaincha* is very economical. In the manure experiments with potatoes, a plot was added to test manures that have given the best returns in Europe, viz., cowdung,

superphosphate and saltpetre. The result was satisfactory, the application of 200 maunds of cowdung, of 3 maunds of superphosphate, and 2 maunds of saltpetre per acre giving an outturn of 203¼ maunds. Castor-cake, however, continued to give the best results with potatoes.

The total expenditure during the year amounted to Rs. 5,116-8-5 and the receipts to Rs. 1,587-11-6 as compared with Rs. 4,954 and Rs. 2,872, respectively, in the preceding year. The cost of up-keep of this station is generously borne by the Maharajadhiraj of Burdwan, to whom the cordial thanks of the Department and the public are due.

Dumraon.—At this station, experiments were continued on sugarcane, mustard and oats. The results of the sugarcane experiments agree with those obtained in previous years, viz, that *khari* is a much hardier variety than the local *mango* cane and yields a much heavier outturn per acre; that the ridge and furrow system (the so-called Bihar Planters' system) of cultivation, gives better results than the local practice of planting behind the plough; and that the application of 200 maunds of cowdung and 8½ maunds of castor-cake per acre can be recommended as economical. In respect of wheat, it has been shewn that the Muzaffarnagar soft white and the red *deshi* varieties of the United Provinces are more prolific than the local varieties. Local cultivators are recommended to change their seed every second year. In the manurial experiments with wheat, 80 maunds of poudrette have given the most economical results; cowdung (83 maunds) comes next. The experiments with different varieties of mustard during the year have corroborated the experiments of the preceding four years in showing that the Jabbalpore and Raipur varieties give better returns than the local varieties of the district. The local variety of oats, known as Dumraon oats, continued to give the best results, and the Deputy Director recommends this variety to the attention of the cultivators. It has been shown at this station that jute can be grown well, provided water is available for irrigation. The total expenditure at this station during the year was Rs. 3,125-1-5 and the receipts Rs. 702-3 as compared with Rs. 3,405 and Rs. 1.202 in the previous year. The cost of the up keep of this station is borne by the Dumraon Raj and the thanks of the Department are due for the public spirit shown by the Raj and the interest taken in agricultural development.

Cuttack.—The principal work during the year at this station was with paddy, jute, potatoes and groundnuts. The experiments with paddy have to a considerable extent corroborated the results obtained at the Burdwan station, viz., that 50 maunds of cowdung or three maunds of bonemeal and 30 seers of saltpetre per acre are the most economical applications, and that planting one seedling per hole about 12 inches apart gives a better result than planting several seedlings per hole. During the year the same experiment was carried out as at the Burdwan station in regard to the growing of winter paddy after jute on the same land in the same year. The results fully corroborate the experience at Burdwan. An average crop of 16⅝ maunds of jute and 18 maunds of paddy (grain) *plus* 34½ maunds of straw was obtained per acre. In this rotation we recommend that in the Cuttack district the jute crop should be sown in the last week of March, and harvested in the latter half of July. It has also been shown at this station that potatoes can be profitably grown after jute on the same land in the same year; but in the case of both of the above rotations manure should be applied to each crop, as the soil is very poor. Patna potatoes have been very successfully cultivated. In the case of groundnuts, the results have been most encouraging and there is already evidence that this crop has attracted the attention of the cultivators in different parts of this and neighbouring districts. Both potato seed and groundnut seed were distributed from the farm to members of Agricultural Associations in the Division with a view to acquainting the people with the value of these crops. A special feature of this station has been the training of student cultivators, deputed with stipends, to work on the farm and gain a practical acquaintance with the methods followed. The Department stocked a number of improved sugarcane presses at this station, hiring them out to cultivators in the neighbourhood, to show them the advantages of using these mills. They were eagerly taken, showing that there is scope in this district for some enterprising firm to start a depôt for the hiring out of iron cane mills. The expenditure during the year amounted to Rs. 9,747-13-4 and the receipts to Rs. 2,968-7-6 only as compared with Rs. 10,755 and Rs. 3,466, respectively, in the previous year. The charges on account of this station are borne by Government.

Bankipore.—This station has an area of 210 acres. All the work so far has consisted in putting the place in order and preparing for experimental work. We hope to commence experiments next year. The expenditure during the year amounted to Rs. 30,337-8-10½ and the receipts to Rs. 152-1-1¼. The charges on account of this station are borne by Government.

Sabour.—This station has an area of 300 acres and will be the home farm of the Provincial Agricultural College. The equipment with buildings was continued during the year; quarters for the Superintendent and an Inspection bungalow were built, as also several iron sheds for storing implements, fodder, etc. The farm was cropped as uniformly as possible and a good deal of clearance of old banks and scrub has been effected. There are several mango groves on the farm, and their systematic cultivation has been taken in hand. Experimental and demonstration work have not hitherto been possible pending the laying out of the farm for these purposes, but the staff has been greatly increased during the year.

The expenditure during the year under report was Rs. 16,098 and the receipts for the year were Rs. 1,630. Government maintains this station.

Chinsura.—Two hundred acres have been taken over at Chinsura for this Agricultural station. Laying out and levelling work has already been commenced, and we hope to get some buildings shortly. The expenditure was Rs. 9,580-1-10. Government bears all expenses.

Chaibassa.—This station was opened in 1906 solely for *tasar* work and is now in full working order. The *tasar* silk cocoon rearing industry in Bengal is declining on account of several causes, one of which is the weakening of the stock through breeding from the same stock too long, without going back to the forests for new seed. At this station we go to the forest every year for wild *muga* cocoons, domesticate them one year and distribute the one-year domesticated cocoons to the rearers in the hope of strengthening their stock. We are now also experimenting with cotton at this station.

In 1907 we distributed 12,740 such cocoons with fairly satisfactory results considering the work is new. Full details are given in the annual report for this station. The expenditure during the year amounted to Rs. 3,505-7-6 and receipts to Rs. 225-1. Government bears all expenses.

Fraserganj.—Seventy-five acres have been taken over this year on this island in the Sundarbans for experimental purposes. So far we have failed to grow jute successfully on the island, as the land is still too saline.

Kalimpong.—Seventy-five acres have been taken over in this hill district for an Agricultural station. The farm is under the Kalimpong Homes, but carries out a programme of work drawn up by the Agricultural Department.

The Government grant is Rs. 5,000 per annum. The Agricultural Department has the first claim on good seed produced at the farm.

APPENDIX IV.

Agricultural Shows and Fairs.

Suri Cattle and Produce Show.—This exhibition has been held for 12 years and has become an annual institution, its object being to encourage, by award of prizes, the improvement of agriculture, arts, and industries as well as of the local breed of cattle and poultry in the district. It is managed by a strong Committee of local zamindars and gentlemen under the presidency of the District Magistrate. It was held this year on the 15th February, and lasted for four days. As a result of previous shows, a larger number of exhibits of cotton, jute, C. P. *aus*, Samudrabali paddy, cassava, potatoes, tobacco and English vegetables new to the district were exhibited by the local cultivators. In the Industrial section, the following deserve special mention:—Silk, *tasar*, cotton fabrics, lac toys, iron dones for lifting water for irrigation and needle-work done by respectable ladies of the district. An Inspector of the Agricultural Department attended this exhibition. He helped the Judging Committee in the selection of agricultural exhibits and demonstrated the working of improved agricultural implements, exhibited some improved seed and manures and explained their use to the people present. He also delivered instructive addresses to the *raiyats* on agricultural subjects especially regarding the conservation of manure and cultivation of cotton. A sum of Rs. 300 was contributed by Government in aid of this exhibition.

Purulia Agricultural and Cattle Show.—This exhibition was held at the head-quarters station of the Manbhum district in the first week of February 1908. The gathering this year was larger than usual in spite of bad weather. The total amount of subscriptions was Rs. 2,113, including the Government grant of Rs. 300. Rupees 439 was distributed in prizes in the several sections of the exhibition.

Bihta Agricultural and Industrial Show.—This year's show was held on 1st March 1908 at Bihta on the *Sivaratri* day in a specially constructed building. The principal object of this exhibition is to improve the local breed of cattle. The number of animals exhibited this year was 128 against 117 last year. The number of exhibits in the Agricultural and industrial sections largely exceeded the number in previous years. Rupees 297 was distributed in prizes to the successful exhibitors and also one gold medal for the best pair of bullocks, one silver medal for soap and another silver medal for wood work were awarded. A large number of Hindi pamphlets supplied by the Agricultural Department were distributed freely to intelligent and literate cultivators who attended the show. Rupees 150 was paid by Government in aid of this show. The success of the show is largely due to Babu Debilal, Honorary Secretary to the Exhibition Committee.

Barahmpur Agricultural and Cattle Show.—The exhibition was opened on the 29th February and lasted till the 2nd March 1908. It is considered that the exhibition was more successful and popular this year than in the previous years. The cattle show was specially very good, and the bullocks and cows which received prizes were of a decidedly high order of excellence. Mr. Smith, Deputy Director of Agriculture, Babu N. L. Mitter, 1st Inspector, Civil Veterinary Department, and Babu Arun Prokash Chowdhury, Divisional Inspector, were present, and helped the Judging Committee. Government contributed Rs. 150 in aid of this show.

Bagdogra Mêla.—The cattle show was held at Bagdogra in the district of Darjeeling from the 3rd to 9th February 1908. The number of animals in all classes brought to the *mêla* was 1,013. The total amount of prizes distributed was Rs. 185. Government contribution in aid of this show was Rs. 150.

Sultanganj Agricultural Fair.—This exhibition was held at Sultanganj in the district of Bhagalpur on the 17th February 1908. It was started with the object of improving th agriculture of the district. The total number of exhibits this year was 541 against 351 in the previous year. A warm spirit of competition was noticed in the people and they were found taking great interest in the fair. Rupees 288 in 135 prizes were distributed to the best exhibitors. An Inspector from the Agricultural Department was deputed to this show. He explained to the people the uses and advantages of improved agricultural implements. Government contributed Rs. 200.

Singhaser Agricultural and Industrial Exhibition.—This exhibition was held in connection with a long-standing fair at Singheser in the district of Bhagalpur on 2nd March 1908 and lasted for three days, during which no less than a lakh of souls visited the place. The number of exhibits in the Agricultural section was 270 and in the Industrial section 240. In the Agricultural section, the exhibits consisted of different varieties of paddy, wheat, pulses, mustard and potatoes, and in the Industrial section several kinds of cotton goods, carpet rugs, *tasar* and brass utensils were exhibited. An Inspector from the Agricultural Department attended the exhibition with improved agricultural implements, demonstrated their working and explained their advantages. Several zamindars and well-to-do cultivators expressed their willingness to go in for improved ploughs. Several varieties of seeds obtained from the Agricultural Department were distributed among the prize-winners and other cultivators. Rupees 278 were distributed in prizes in the Agricultural section, Rs. 281 in the Industrial section. The cattle show was poor and there were only 50 bullocks, cows and bulls. In order that more cattle might be brought to the show in future years a liberal scale of reward was allowed. The first prize amounted to Rs. 20, and Rs. 128 in all was paid in rewards under this head. Government contributed Rs. 150. The success of the show was chiefly due to the energy of Babu Saroda Prosad Sarkar, Subdivisional Officer, Madhepura.

Kushtia Agricultural and Industrial Exhibition.—An Agricultural and Industrial Exhibition was held for the first time at Kushtia in the district of Nadia on the 6th February 1908 and lasted for seven days. The exhibition aimed at the improvement of the condition of the people of that subdivision who were chiefly agriculturists and small artisans. The exhibits in the Agricultural and Industrial sections were numerous. The attendance of the people, including artisans and agriculturists, was good on the last two days. Several impressive lectures were delivered during this time by an Inspector of the Agricultural Department which related to the cultivation of potatoes, cotton, jute and C. P. *aus* paddy. The working of the Meston plough was demonstrated. The Subdivisional Officer took a keen interest in the exhibition, and its success was chiefly due to him. Government contributed Rs. 200.

Baraset Agricultural and Industrial Exhibition.—The show was held on the 6th February 1908 in the Subdivisional Officer's compound and continued for four days. The agricultural exhibits this year were not very attractive through failure of crops for want of seasonable rain. The area for which exhibits were accepted being limited to the Baraset subdivision, the number was not very large. It is intended now to extend the area and accept suitable exhibits from outside also, so that they might serve as stimulating examples to local agriculturists. An Inspector from the Agricultural Department attended this exhibition with some improved agricultural implements; he demonstrated their working and explained the method of cultivation of several crops to a large number of cultivators who assembled at the exhibition. Government contributed Rs. 200 in aid of this exhibition and Rs. 195 was distributed in prizes. A Committee has been formed here for the systematic propagation of the results of agricultural experiments carried on by the Agricultural Department.

Dumka Agricultural, Industrial and Cattle Show.—The Dumka Show has been in existence for about 18 years. The main object is to encourage agriculture and industries in the district, but to make it attractive to the Sonthals who prefer to stick to their primitive ideas some sports are provided. The prizes awarded in previous years to the successful exhibitors induced many Sonthals to come in with agricultural produce this year from a considerable distance. There were among the exhibits some very fine varieties of rice not previously grown in the district and also some improved varieties of maize of which the seed was imported from up-country. The cultivation of cotton appears to have received some attention and several exhibits of Buri cotton were brought. The cultivation of sugarcane is making gradual progress. A few people in the interior have already taken to the cultivation of potatoes—a crop unknown in this district till a few years ago.

Good specimens of cattle and poultry were exhibited and suitable prizes awarded.

An Inspector from the Agricultural Department attended this exhibition with improved agricultural implements, grains and manures. He explained the uses of the implements and manures and their advantages. Government contributed Rs. 100 towards the cost of this exhibition.

Pakur Agricultural and Industrial Exhibition.—This Exhibition was held from the 24th to the 28th February 1908 at the head-quarters station of the Pakur subdivision in

the Sonthal Parganas. This was inaugurated in the coronation year of His Majesty the King-Emperor and has been held annually ever since. This year the site was removed to a larger plot of land lying between the thana and the subdivisional residence. The exhibits this year were numerous. Hill *bajra*, lac, cocoons, *ghangra*, roots and tubers used as food during years of drought and scarcity, several varieties of paddy, specimens of jute grown in the eastern portion of the subdivision, different kinds of *ghooting* (limestone), varieties of clay and other articles of interest were displayed. Potters and weavers were at work in the exhibition ground. Several very fine head of cattle, including goats and sheep and some poultry were exhibited. An Inspector from the Agricultural Department attended the exhibition with some improved agricultural implements and samples of the best varieties of paddy, jute, cotton, maize and mustard. He explained the uses of the implements and their advantages. A maize huller attracted notice.

Hooghly Exhibition.—An Agricultural and Industrial Exhibition was held at Chinsurah on the 15th February 1908 and remained open for ten days. It was free to the public. Various kinds of paddy, cereals, jute, cotton, pulses, seeds, vegetables, fruits, flowers, cotton goods, needle-work, carpets, silks and agricultural implements were exhibited. Lectures on agricultural subjects were delivered by an Inspector of this Department and his practical demonstrations of the improved agricultural implements were much appreciated by the people. Some of the best weavers in Bengal live in the district of Hooghly, and there was a gathering of several expert weavers of the district on the exhibition ground at the weaving contest, the Committee having announced the award of a gold medal for the best weaver. The success of the exhibition was chiefly due to the energy of Mr. B. De, the Magistrate of the district. Government contributed Rs. 250.

Sitamarhi Exhibition.—In connection with the *Ramnowmi* Fair at Sitamarhi, which lasted this year from 10th to 19th April 1908, a cattle show was held as usual on 11th April 1908 The total number of cattle brought to the *mêla* was 40,000, but only 220 competed for prizes. A sum of Rs. 221 was distributed in prizes. On the 12th April an Agricultural and Industrial Exhibition was held. This was the second of its kind here. It was more successful this year; the number of exhibits was larger than in the preceding year. Rupees 51 were awarded as prizes to the successful exhibitors in these sections of the exhibition. Government contributed Rs. 200.

Kurseong Exhibition.—This exhibition was held at Kurseong in the district of Darjeeling on the 20th April 1908. Horses, ponies, cattle, poultry, flowers, vegetables and fruits were exhibited and prizes were awarded to the successful exhibitors. The number and quality of the exhibits of the cultivators were not very encouraging. It is difficult to interest the hillmen in an exhibition of this sort. Government contributed Rs. 200.

Banjetia Industrial and Agricultural Exhibition.—The exhibition was opened by the Divisional Commissioner on the 26th February 1908 and lasted for six days. It was divided into three sections, viz.,—Agricultural, Industrial and Livestock. Each section was fairly represented. The competition was restricted to the district of Murshidabad only. The processes of rearing the silkworm, of weaving, and preparing silk for commerce, the different stages of lac production and the process of making glass bracelets (*churis*) were very interesting and attracted the visitors' attention. An Inspector from this Department attended the exhibition and showed some agricultural implements. He also delivered lectures on agricultural subjects. Livestock exhibits were very poor. Government contributed Rs. 250 in aid of this exhibition. Maharaja Manindra Chandra Nandi of Cossimbazar bore the largest portion of the expenditure in connection with this show.

Kalimpong Mêla—This exhibition was held on the 27th November 1907. No detailed account is available, as Dr. Graham, Honorary Secretary to the Exhibition Committee, went home on sick leave. From a statement it appears that the total number of entries in all sections was 1,435, and 346 prizes, amounting to Rs. 1,512, were distributed. Government contributed Rs. 850 in aid of this show.

Sambalpur Agricultural and Industrial Exhibition.—This exhibition, which was started in 1905-06, was held on two occasions in the village Huma, 14 miles from the head-quarters station of the district. This year it was held at Sambalpur from the 11th to the 14th February 1908. The exhibits fairly represented all classes of both the Agricultural and Industrial sections. Potatoes, a new crop introduced into the district five or six years ago, were exhibited. Their cultivation is increasing every year. Fine specimens of *tasar* cloth, *ganda* cloth and *gur* were exhibited. The *gur*, which took the first prize was clean, well crystalised and much superior to the ordinary produce of the district. Rupees 862 were distributed in prizes, and two silver medals—one for the best potato exhibit and the other for the best *tasar* cloth—were awarded. Government contributed Rs. 300 in aid of this exhibition.

Khulna Coronation Exhibition.—This exhibition was held in the town of Khulna on the 8th February 1908 and continued till the 16th of the same month. It was divided into Agricultural, Industrial and Arts sections. Each section was fairly represented. In the Agricultural section, different varieties of paddy, jute, cotton, Naini Tal potatoes, and *Samsara* sugarcane deserve special mention. It would appear that the soil of the district is suitable for the potato and cotton crops which have only lately been introduced. Altogether 24 silver medals were awarded besides prizes in cash. Government contributed Rs. 500 in aid of this exhibition.

Chaibassa Mêla.—On the 7th January 1908, an Agricultural, Industrial Exhibition and Cattle Show was held at Chaibassa. Out of the sum of Rs. 200 contributed by Government towards the *Mêla* fund Rs. 154 was distributed in prizes to the successful exhibitors. The exhibition was on the whole successful.

Bihar Industrial and Agricultural Exhibition.—The exhibition was opened at Bankipore on the 22nd February 1908. This year the exhibits were grouped under Agricultural and Industrial heads. The Industrial section was well represented. A large number of exhibits was exhibited in the Agricultural section. The flower show held in connection with the show was successful. The Ramkola Factory in Saran exhibited very big canes of the Mauritius variety grown in the factory which created much interest. The Burma paddy-husking machine was much appreciated by the visitors. The Agricultural and the Veterinary experts delivered addresses to the cultivators who were specially invited on the occasion. Government contributed Rs. 500 in aid of this exhibition.

APPENDIX V.

Report of the Scientific work on Indigo during the year 1907-08.

The full annual report on this subject was published in January of this year. It is divided, as has been customary in past years, into three main sections:—Laboratory work, Manufacture and Agriculture. Under the first heading, a summary is given of the scientific papers on indigo which were published during the year. The majority of these came from Leeds University, where Mr. Bloxam was carrying on the researches which have been referred to in past reports. The results of his work have since been summarised by Mr. Bloxam in a report to the Government of India. The practical conclusion drawn is that there is yet room for improvement in the efficiency of indigo manufacture to the extent of some 60 per cent. This conclusion is opposed to that which I have come to on grounds given in various past publications and I am still obliged to disagree with Mr. Bloxam on the subject. I must refer those interested to these publications for details of the matter.

The other subject referred to in this section of the report is a practical dye-test of natural *versus* synthetic indigo which was carried out at the Cawnpore Woollen Mills early in the year. A full account of the test has been published elsewhere. The conclusion arrived at was markedly in favour of natural indigo, but it is pointed out in the current report that doubt is thrown on this conclusion by the discovery, subsequently made, that "brand E" of the Badische Anilin and Soda Fabrik had been supplied for the test and that this contains a large quantity of lime. This in itself would, to a great extent, account for the results obtained, so that a careful repetition of the test in which "brand E" is avoided is necessary before a conclusion can be drawn. This is at present being carried out.

Manufacture.

Under this heading, the experiments which have been recorded in past years on the relation which should exist between temperature of water and time of steeping are amplified and a conclusion is drawn from the combined result which is summarised in the following table:—

Temperature (in degrees F).	90°		93°		96°		99°		102°		105°	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
Period of steeping Java plant ...	12	30	11	30	10	30	9	30	8	30	7	30
Period of steeping Sumatrana plant.	10	30	9	45	9	0	8	15	7	30	6	45

It is pointed out that the periods given apply to.—

(*a*) Plant in *average* condition, that is to say to plant cut after the rains have set in, and before the cold weather has begun from land which is in fair heart, and has not been subject to any exceptional condition such as flooding.

(*b*) Vats not loaded more heavily than 120 maunds per 1,000 cubic feet.

The periods given should be made half an hour longer in dealing with plant which is exceptionally leafy or is judged to be exceptionally rich in colour-yielding material for any other reason; or, conversely, half an hour shorter if the plant is exceptionally "sticky" or otherwise of poor quality. Plant cut before the break of the rains should be given two hours' extra steeping at 90°, and a proportionately smaller increase at the higher temperatures. Under no circumstances should steeping be carried out at a lower temperature than 90°F.

Several days during the "mahai" season were devoted to experiments on the influence of the rate of loading the vats. It was found that with Java plant average of quality (40—45 per cent. of leaf and ·6—·7 per cent. indigotin in the leaf) steeping for 12¾ hours at 90° F., the following average efficiencies were obtained with various loads:—

80	maunds	per	1,000	cubic	feet	=92·7 per cent. efficiency.
100	,,	,,	,,			=88·2 ,, ,,
120	,,	,,	,,			=83·8 ,, ,,
140	,,	,,	,,			=77·5 ,, ,,

It is thus clearly indicated that lighter loads tend to a higher efficiency; moreover, the losses sustained in the seet-water were not heavier in these cases than is usual. Light loads are, therefore, to be recommended with plant of this quality.

With poorer plant such advantage does not arise. During a few days at the end of "mahai" experiments were carried out with Java plant, in which the leaf and colour-contents had already begun to drop, loading at the rate of 80 maunds per 1,000 cubic feet and steeping for periods of 11 and 12 hours. It was found that an average efficiency of only 78·5 per cent. was attained at the latter period and of 87 per cent. at the former. A choice seems to lie open, therefore, between decreasing the period of steeping by about an hour for every decrease in load of 40 maunds per 1,000 cubic feet, or maintaining the normal period of steeping (see preceding paragraph) and loading more nearly up to 120 maunds per 1,000 cubic feet. The latter course is recommended. This recommendation applies also to Sumatrana plant under all conditions.

Another matter to which considerable attention was given was the determination of the influence of the addition of alkalis and alkaline substances to the steeping-vat. Reference had been made to this matter in a previous report and it had been pointed out that all former experiments had indicated that, if ammonia (or other alkali) were used in oxidizing, no benefit was to be anticipated from the use of alkaline substances in the steeping vat. Since, however, much had been claimed for a patent process depending upon the use of such a substance, I was asked to go into the matter afresh. To this end the patent alkaline body "Glucosode" was prepared in accordance with its specification, and the results obtained by its use were compared, not only with those of the ordinary manufacturing process (*i.e.*, steeping Sumatrana plant 10½ hours at an average temperature of 90° F., and oxidizing with the employment of ammonia gas), but also with the results derived by using in the steeping vat an equivalent amount of caustic alkali to that involved in the "Glucosode" employed, both with and without ammonia in oxidizing. Fourteen hours' steeping was given in these cases, this period having been found the optimum when the particular amount of alkali in question was used. The effect of using ammonia in oxidizing in conjunction with "Glucosode" was also tried. The following results were obtained:—

Process.	Average percentage efficiency.	Average quality.
"Glucosode"	73·2	56 %
Ordinary	83·5	63·7 %
Alkali equivalent to "Glucosode" ...	75·7	58·2 %
Alkali equivalent to "Glucosode" and ammonia in oxidizing.	74·3	68·9 %
"Glucosode" and ammonia in oxidizing ...	84·3	55·2 %

The "Glucosode" process has thus not given as efficient result as the ordinary one and, as was to have been anticipated, they are practically the same whether "Glucosode" or its equivalent in alkali is used, that is to say the other constituents of "Glucosode" are without effect on the result. By using ammonia in conjunction with "Glucosode" a higher efficiency is obtained, but since no appreciable improvement is shown over the ordinary process, this is insignificant. The reason for the comparatively low efficiency when alkali and ammonia are used jointly is not clear. More experiments are needed on this point.

The quality of the indigo obtained by the "Glucosode" process, and also by that in which an equivalent of alkali was used in steeping, is low, and it would seem that such processes are distinctly to be deprecated on this score.

The practical outcome of these tests is then that, provided due regard is paid to the conditions of time and temperature which have been laid down and an alkali is used in oxidizing, no improvement in yield is to be obtained by the use of alkalis or of alkaline mixtures of the nature employed in the steeping-vat, and the quality of the indigo obtained is apt to be distinctly inferior.

It has been suggested that this test of the "Glucosode" process is incomplete, inasmuch as it involves no comparison between that process and the "ordinary" one as understood by planters, that is to say a process in which no regard is taken of the temperature of the water in steeping and no alkali is used. No object would, however, be served by such a comparison. I pointed this out, so far as the question of the use of alkali is concerned, in my first report (1905-06, page 5), in which I justified the designation of the process involving the use of ammonia gas as "ordinary" as follows:—"It may be objected that by introducing this method (the ammonia gas process) into the experiments the "ordinary" process as understood by planters has not been dealt with. The reply to this is, that without so doing it would be quite impossible, within a reasonable number of tests, to obtain concordant results, the variation in the efficeiency of oxidation being so great, but that, on the other hand, the ammonia process effects very little, if any, improvement over "ordinary" oxidising when this is carried out under optimum conditions of speed, weather, water, etc., so that results obtained with its use represents the optimum conditions of "ordinary" oxidation. The process is thus of the nature of an assurance of perfect oxidation, and it is for this reason that it has been used in the following experiments, and for this reason that I consider it should be used by every planter."

Precisely the same thing has since been found to hold with regard to the warming of the steeping water. A series of experiments in which attention to these points was neglected, would, therefore, show nothing except the low average efficiency which would be attained over a number of days and there is no doubt that a comparison with any process (*e.g.*, the "Glucosode" process) in which they were regarded would turn out to the latter's advantage. Since, however, this has frequently been demonstrated, and since it is shown in the above table that the same result as is obtained by the use of "Glucosode" can be gained by the use of pure alkali in steeping (and a much more efficient process by using alkali in oxidising), no object would be served by repeating the demonstration.

"Mahai" was carried out during a few days in December in order to see what degree of efficiency in the process could be attained at this late season of the year if proper attention were paid to the heating of the water for steeping. It was found that no difficulty existed in this respect, the efficiency being as high as at any other time. The quality of the indigo produced was poor, but this might be improved by using additional acid in the boiling process. In any case "mahai" seems well worth doing at this season if the area of plant in a fit condition to cut is sufficiently large, particularly since the cutting is likely to be of great benefit to the plant.

An apparatus for filtering seet-water was given a thorough trial during the season. The apparatus is in type very like a filter-press, but differs from it in that the liquid to be filtered flows through under natural pressure instead of being forced by a pump. The liquid passes through a series of chambers whose walls consist of coarse cloth spread over frames, and the solid matter in suspension is deposited on the cloth whilst the clarified liquid passes away. The results obtained were rather disappointing; for, although a great deal of indigo was retained, it was found that with new cloths filtration was by no means perfect and that, after the cloths became coated with a layer of sludge, filtration was improved, but the rate of flow became so slow that the use of the apparatus on a large scale would be impracticable. Thus an average of only 40 per cent. of the total indigo-content was removed from the seet-water during the days the appparatus was under trial, and the average rate of flow works out to nearly 9 hours per 1,000 cub. feet. It is true the seet-water experimented with contained, in many cases, an exceptionally large amount of indigo in suspension, but even when the content was about normal (5—10 per cent. of the total outturn of indigo) the flow was too slow, and the apparatus cannot be recommended for general adoption as it stands. It is, however, a marked improvement over the filter-press tried by Rawson for the purpose (Report, 2nd edition, page 86), and it seems subject to several structural modifications which would render its working more rapid and efficient. These have now been introduced and the apparatus will be tried again during the present season.

A new machine for the preparation of indigo in powder form was also experimented with. The results obtained were not altogether satisfactory, but the difficulties are purely mechanical ones, and certain modifications which have now been made in the machine should lead to better working this season.

Agriculture.

Under this head a somewhat detailed account is given of the results obtained from a series of manurial experiments which were put down in the autumn of 1905, but gave no definite results last year owing to floods. The object of the experiments was to determine what specific chemical substance, if any, in the manure applied led to the production of indican (the indigo-yielding glucoside) in the plant. The conclusion drawn is a negative one, since it is found that the plots receiving no manure gave as high, or somewhat higher, yields of indigotin as those receiving complete manurial treatment. So far as the experiments go they indicate that Indian production is independent of, or actually decreased by, manurial treatment. It would thus seem to be something of the nature of a starvation phenomenon, a theory which seems to carry support from the facts that plant grown under minimum moisture conditions (*e.g.*, plant cut before the break of the rains) has invariably a high colour-content and that in years of adverse climatic conditions of all descriptions (*e.g.*, the past year), the average colour-yielding power of the plant is frequently abnormally high. This may, of course, be explained to some extent by the stunted growth of the plant and its consequent high leaf-content, but it may well be that this is not the *whole* of the explanation.

Some trials of the effect of various plant-stimulants on the production of indican are now in progess. Salts of some of the less common metals (*e.g.*, nickel and manganese), which normally behave as plant poisons, have been found to have a beneficial effect on cereals and other crops when applied in extremely small amounts, and it is conceivable that in application to indigo a larger secretion of the colour-yielding principle might be induced. If the theory that indican production is of the nature of a starvation phenomenon be true, it lends probability to this idea, since the production of indican might well be stimulated by the slightly adverse conditions which the various applications may be expected to bring about, just as it is apparently stimulated by the adverse conditions accompanying semi-starvation.

A start has been made in the selection of the Java plant by analysing the leaf from a large number of individual plants and retaining those which showed a high content of indican for seed-bearers. This seed has been collected and will be sown this year and the

plants obtained analysed in order to determine what proportion of them maintains the high indigotin-yielding power of the parent plants. Any such plants found must again be kept for seed and so on, until, by gradually eliminating the plants of low colour-content and deriving seed only from such plants as have a dye-yielding power, a stock of seed which can be relied upon to produce plant of the nature sought is built up. Very considerable differences in dye-yielding power were found between the various plants analysed, and there were certain indications that these differences were accompanied by varying botanical characteristics. If these could be established it would simplify the selection problem enormously since it would eliminate the necessity for basing everything on chemical analysis. The services of an expert botanist are, however, essential to such work, and we have, unfortunately, not yet this assistance. I consider it is absolutely essential that we should obtain this if any further material advance is to be made in indigo research. This is by far the most hopeful line of work, and we have hardly been able to touch on it hitherto.

The selection of the Sumatrana plant also awaits botanical attention. A number of sub-varieties are growing here this year, but it will not be possible to do more than run through their analysis and confirm, or otherwise, the results reported given in my 1906-07 report, and save their seed for future work.

The results of some experiments on the cultivation of Sumatrana seed in Bihar and on the most suitable rate of sowing it are recorded in the current report. It is shown that the seed can be grown in Bihar quite satisfactorily, though the cost of production would probably be greater than in the North-West. As regards the rate of sowing, the opinion that it would be of advantage to sow at a considerably lower rate than has been customary in Bihar hitherto, which I expressed in last year's report as the result of experiments conducted here, is confirmed by figures obtained by Mr. E. H. Hudson of Rajpore concern. It is probably unwise to sow more highly than 8—9 seers per acre in a year of drought like the last.

In connection with the Java plant, figures are given showing its enormous superiority over the old variety both as a result of experiments here and the practical experience of planters. It is shown that the average yield of indigo from the plant, calculated both on the acre and on the 100 maunds of plant, in 1907 was uniformly higher than in 1906 over Bihar. This seems to argue against any deterioration in the seed having taken place.

A few modifications have been made in the sulphuric acid method of treating the seed before sowing which has now been generally adopted and found completely successful.

Notes are also inserted on sowing Java seed, on cutting the plant back early in the year, and on cutting for *mahai*.

Finally, the results of a series of experiments on methods of cultivation of Java seed are given. It was found that, from the point of view of yield, distinct disadvantage attached to thinning the plant out. *Topping* the plant (*i.e.*, nipping off the leading shoot to induce branching) in June was of advantage. The second year's crop of seed which was gathered from the plots early this year contained these results and showed that a considerably smaller yield is to be anticipated under all conditions of cultivation from second-year plant. Some further experiments started last year have also shown that no advantage attaches to thinning either in the usual manner or by means of alternate rows of plant and fallow.

The effect of the various methods of cultivation on the quality of the seed remains to be seen; it seems likely that spacing the plants will improve the quality, since in so doing an effort is made to select specially vigorous plants.

Some anxiety was caused during the past year by the appearance of certain diseases in indigo. In one case the cause has been traced by Mr. Lefroy, the Imperial Entomologist, to an insect-pest known scientifically as *Poylla Obsoleta*, and a report on the subject has been issued by him to members of the Bihar Planters' Association. Mr. Lefroy considers that the appearance of the pest may be connected with the generally adverse conditions of the season, but points out that, by the introduction of the Java plant, a condition of affairs has been set up under which indigo is standing in the fields all the year round, thus affording harbouring places in which insects may hibernate which did not exist when only the annual Sumatrana plant was grown. Greater care will therefore have to be exercised in guarding against such pests than has been necessary hitherto. It is too early to say what damage may have been done by this pest this year, but it would seem that though it is very widespread it has not led to any great harm.

The other disease which has attacked indigo seems to be of a more serious character. It is of a fungoid nature and has been responsible already for great lossess. The matter is still somewhat obscure, but it is under study by Dr. Butler, the Imperial Mycologist, and every effort will be made to combat it.

APPENDIX VI.

A List of Agricultural Implements and Machines which have been tested in Bengal during the year ending 30th June 1908 and of those in use which are reported to have met with success.

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officers.	Opinion.	Extent to which used by agriculturists.
1	2	3	4	5	6	7	8	9
				Rs. A. P.				
1	Sibpur plough ...	Ploughing and breaking soil.	Inverts soil effectively.	7 0 0	Agricultural Department.	Collector of Burdwan and Deputy Commissioner of Angul.	Being made of wrought-iron it may be easily repaired.	It is not suited for Angul district, being too heavy for bullocks of the district.
2	Meston plough ...	Ploughing ...	.....	4 0 0	Ditto ...	Collector of Burdwan and Manager of Syedpur Estate (through the Collector of Khulna).	Useful. In moist soil, it is not serviceable.	.....
3	Ditto ...	Ploughing fields ...	Ploughs deep and uniform: unlike the country plough it does not leave any ridge between furrows.	54 6 6	Ditto ...	Subdivisional Officer of Madhipura (through the Commissioner of the Bhagalpur Division).	Useful and appreciated by cultivators wherever tried.	.....
4	Ransom's and Jeffrie's plough.	.....	.....	...	.....	Collector of Midnapore.	.....	.....
5	Knapsack's sprayers.	.....	.....	...	.....	Ditto ...	.....	.....
6	Double mould board plough. *	Cane planting and ridging.	Plants cane in lines.	10 0 0	Protabpur Sugar Factory.	A. G. B. Hay, Esq., Manager, Protabpur Indigo Concern (through the Commissioner of the Patna Division.	Very useful when used in conjunction with the Bakhar plough.	.....
7	Bakhar plough ...	Hoeing cane and *makai* fields.	Saves labour ...	3 2 0	Protabpur Indigo Factory.	Ditto ...	.....	.....
8	Improved hand-hoe.	Weeding purposes	.....	...	.....	Subdivisional Officer of Madhipura (through Commissioner of Bhagalpur.)	.....	.....
9	Planet Junior hand-hoe.	Hoeing	.....	36 0 0	Agricultural Department.	Member of the Purnea District Agricultural Association and Collectors of Midnapore and Burdwan.	A useful, small machine, but will not stand hard work.	.....
10	Behia sugarcane mill.	Crushing sugar-cane.	Juice can be extracted in a short time with less labour and expense.	75 0 0 to 140 0 0	Messrs. Thompson, Mylne, Behia, district Shahabad.	Deputy Commissioner, Angul, and Collectors of Burdwan and Midnapore.	Very useful and appreciated by cultivators.	348 sold during the year.
11	Sugar-boiling pans	Manufacturing molasses.	A large quantity of juice can be boiled at one time and the froth removed readily.	15 0 0 to 20 0 0	Ditto ...	Ditto ...	Ditto ...	.....
12	Watson's scarifying machine.	Used for Java and Natal indigo seed.	An improvement over the old kind of machine.	240 0 0	Messrs. A. Butler & Co., Muzaffarpur.	R. Macrae, Esq., Manager of Maniara Factory (through the Commissioner of the Patna Division.)	Good	.....
13	Machete	Cutting canes ...	Does not bruise cane sets for planting.	18 0 0 per dozen.	Messrs. T. E. Thompson & Co., Calcutta.	G. E. Llewhillire, Esq., Manager of Ramcola Estates (through the Commissioner of the Patna Division.)	.....	.....

* These implements in an ordinary moisture year worked in conjunction with Bakhar plough enable ten hoeings to be done at the rate of 3 acres per day at a cost of 1½ anna per acre.

No.	Designation of implements.	Use.	Special advantage or instruction.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by agriculturists.
1	2	3	4	5	6	7	8	9
				Rs. A. P.				
14	Mowers	Mowing barley, wheat and oats.	Efficient	590 6 0	Walter A. Wood, Mowing and Reaping Machine Co., London.	A. G. B. Hay, Esq., Manager, Pratabpur Indigo Concern (through the Commissioner, Patna Division).	Very useful and saves labour and cost.	.....
15	Winnower ...	Corn dressing ...	.....	502 9 0	Messrs. Jessop & Co., Calcutta.	A. G. B. Hay, Esq., Manager, Pratabpur, Indigo Concern (through the Commissioner, Patna Division).	Not useful ...	.....
16	Eureka mill* ...	Sugarcane pressing.	Would enable raiyats of several villages to work off their cane more quickly and economically than by present system of numberless small Behia, &c., mills.	Mill (only) 1,500 0 0 Engine 3,600 0 0	Ditto ...	J. D. Macgregor, Esq. (through Commissioner, Patna Division).	Simple, strong and efficient.	.....
17	Corn crusher† ...	For crushing oats and grains, etc.	Works more effectively and more economically than ordinary stone mills used locally.	135 0 0	Ditto ...	M. M. Mackenzie, Esq., Superintendent, Sripur Farm.	Can be well recommended for small farms and staples.	.....
18	Drills	Sowing indigo ...	.....	25 0 9	Made by local carpenter (Champaran).	These implements were tested in the district of Champaran.	.....	.....
19	Golion	Ploughing ...	.....	20 0 0	Calcutta			
20	Digging fork ...	Digging of cane fields and removing silt.	.....	1 0 0	Ditto			
21	Teeth roller or *kalohio*.	Breaking large clods of earth.	.....	15 0 0	Made locally at Champaran.			

* This mill has been worked for five months at Arowali and Barhoga concerns without a hitch, giving satisfactory results and has been a good object-lesson to raiyats all around who are most interested in its working.

† Two men worked at a time. The average quantity of grain crushed per eight hours a day amounted to 12 maunds.

APPENDIX VII.

Expenditure on miscellaneous experiments and enquiries during the year ending 30th June 1908.

Experiments other than those made in Experimental Stations.

	Rs.	A.	P.	Rs.	A.	P.
Central Seed Store				15,446	11	7
Supply and Services—						
Seed	2,893	7	7			
Manures	4,737	6	0			
Implements	3,022	3	6			
Other charges	1,127	10	6			
Rent of Seed Store	2,400	0	0			
Establishment—Pay and travelling allowance ...	1,266	0	0			
Special crops				67,325	12	8
Improvement and extension of cotton cultivation	1,988	12	8			
Contribution to the Bengal Silk Committee ...	7,500	0	0			
Improvement of sericulture in Bengal ...	1,337	0	0			
Bihar Indigo Planters' Association	50,000	0	0			
Tea Association	3,500	0	0			
Jute experts	3,000	0	0			
Agricultural Associations				20,783	7	9
Central Association	5,524	10	0			
Contribution to Divisional and District Agricultural Associations.	6,000	0	0			
Books for Divisional and District Agricultural Associations.	77	0	0			
Establishment—Pay and travelling allowance of Divisional Agricultural Inspectors ...	9,181	13	9			
Distribution of Agricultural Literature ...				2,466	5	11
Temporary Establishment	159	2	8			
Printing at private presses	2,307	3	3			
Expert staff—Pay and travelling allowance of Travelling Inspectors and Supernumerary Officer	3,337	9	7	3,337	9	7
Miscellaneous				33,976	11	5
Contribution to Agricultural and Cattle Fairs ...	7,050	0	0			
Temporary establishment—Pay and travelling allowance for Agricultural and Cattle Fairs.	201	15	0			
Carriage of implements, etc., for Agricultural and Cattle Fairs.	49	1	7			
Deputation of students to foreign countries ...	22,782	4	0			
Deputation of officers to special duty ...	3,893	5	10			
Total ...	1,43,336	10	11	1,43,336	10	11

B. S. Press—20-10-1908—2698J—660—J. A. C. M. & others.

REVENUE DEPARTMENT.

AGRICULTURE.

CALCUTTA, THE 11TH NOVEMBER 1908.

RESOLUTION—No. 4298.

READ—

The Report of the Department of Agriculture for the year ending the 30th June 1908.

The Report has been prepared by Mr. W. R. Gourlay, I.C.S., who succeeded the Hon'ble Mr. C. E. A. W. Oldham, I.C.S., on the 12th of November 1907, and has since held charge of the Department. There bas been some delay in the submission of the Report which, it is hoped, will be avoided in future.

2. *Organization of the Department.*—The creation of a Subordinate Agricultural Service, comprising officers drawing less pay than Rs. 150 a month, has received the sanction of the Government of India. The question of a Provincial Service is still under consideration. Mr. C. S. Taylor, B.A., Agricultural Chemist, and Mr. E. J. Woodhouse, B.A., Economic Botanist, joined the Department during the year. They have undergone a preliminary training, the former under Dr. J. W. Leather, at Pusa, and the latter under Professor A. Gammie, at Poona. The office of the Registrar of Co-operative Credit Societies has been made subordinate to the Director of Agriculture who has been gazetted Director of Co-operative Credit Societies, and the former has been appointed an Assistant Director of Agriculture.

3. *Quinquennial wage census.*—The statistics of wages of skilled and unskilled labour now furnished in the fortnightly returns being unsatisfactory, the system will be replaced by a quinquennial wage census to be carried out by the Director of Agriculture on the lines of a scheme drawn up by Mr. Moreland, Director of Land Records and Agriculture, United Provinces of Agra and Oudh. Arrangements were made during the year to hold the first census in August 1908. One officer was chosen from each district for the collection of the required statistics. These officers were called together in Calcutta, and the Director, after having consulted Mr. Moreland at Lucknow, explained to them the methods and objects of the enquiry. The statistics thus collected were to be checked by means of returns obtained from non-official gentlemen who were furnished with forms and suitable instructions.

4. *Agricultural stations.*—Considerable progress was made towards completing the requirements of the Province in respect of agricultural stations contemplated in the scheme for the development of the Agricultural Department. The stations at Bankipore and Sabaur are practically complete. At Chinsura, which will represent the deltaic alluvium, much progress has been made. At Kharagpur 200 acres of land have been made over by the Public Works Department for a station to represent the laterite area which stretches across the districts of Midnapore, Birbhum and Bankura. A site has also been selected, and the land will shortly be acquired, for a station at Ranchi representative of the peculiar agricultural conditions of the Chota Nagpur plateau. These will complete the required number of stations. A short account of the work of the existing agricultural stations is given in Appendix III to the Report.

A demonstration farm, consisting of about 70 acres, has been opened at Kalimpong in the district of Darjeeling. It will be worked by the St. Andrew's Colonial Homes assisted by a Government grant of Rs. 5,000 per annum for five years, but the demonstration work will be guided by the Deputy Director of Agriculture.

The Agricultural Department has also been given 50 acres of land for a special demonstration farm at Fraserganj.

5. *Scientific Experiments.*—Experiments on the lines indicated by the Inspector-General of Agriculture were carried on with success at Burdwan and Cuttack. The results, which are summarised in paragraph 21 of the Report, have been published in a special leaflet, English and vernacular copies of which have been freely distributed in all jute-growing districts of the Province. Two well-equipped jute seed farms, one at Purnea and the other at Berhampur, were maintained by the Provincial Agricultural Association, and the 53 acres under cultivation in these farms yielded 230 maunds of excellent seed. The low price of jute and high prices of food-grains, combined with unfavourable weather, hindered the jute experiments undertaken by the Indigo Planters of North Bihar and had the effect of considerably decreasing the area sown by them during the year.

Experiments in the cultivation of flax had been going on for some time in Bihar. In 1906-07 the Bihar Indigo Planters' Association, assisted by a grant from Government, procured the services of a Belgian Expert, Mr. E. Vandekerkhove. His work has had some encouraging results, and it has been decided to retain his services for five years, the Imperial Agricultural Department meeting one-half of his salary, and the Provincial Department the other half, all other expenses being defrayed by the proprietors of the Dooriah Indigo Concern. A review of the expert's work of the year is given in Appendix II to the Report.

The experimental cotton cultivation at Chakradharpur proved a failure as the land was unsuited to the crop.

6. *Irrigation.*—The well-boring staff sanctioned in 1906-07 in accordance with the recommendations of the Indian Irrigation Commission has commenced its work. Babu Upendra Nath Sen, a first grade Sub-overseer of the Public Works Department was appointed Superintendent of Well-borings in February 1908, and was in training for two months at Cawnpore under the Director of Agriculture, United Provinces. The Superintendent has made trial borings at Sabaur, Bankipore and Pusa, and is now stationed at Bankipore where he is training 12 borers, one for each district of the Bhagalpur and Patna Divisions. The question of employing a special staff to draw up reports and maps showing the local conditions and needs of each tract as regards irrigation, embankments, etc., and to help small proprietors and tenants to make the best use of their opportunities for improving the irrigation of their lands, is still under the consideration of Government.

7. *Sericulture.*—To give effect to the recommendations of the Committee appointed to enquire into the state of the silk industry and the causes of its decline, Babu Apurba Kumar Ghosh, who had been trained in scientific methods of sericulture by the late Mr. N. G. Mukharji, was appointed Superintendent of Sericulture, with effect from the 1st April 1908. The sericultural work has been placed under the control of a Managing Committee with the Director of Agriculture as its President. On a suitable plot of Government land 60 acres of mulberry have been planted out, and plans and estimates have been prepared for a central nursery and five subsidiary nurseries. Certain experiments conducted by the Superintendent in connection with the cold storage of seed cocoons have been successful. The thanks of the Lieutenant-Governor are due to the members of the Bengal Silk Committee for the good work done by them during the period the operations were in their hands. The sericultural school at Sabang in the district of Midnapore, which receives a grant of Rs. 30 *per mensem* from the District Board, continued to do useful work. Four scholarships of Rs. 5 *per mensem* have been founded, and a microscope has been purchased, for this school at the expense of Government.

8. *Agricultural Education.*—At the annual examination held in November 1907, seven students of the agricultural classes at Sibpur obtained diplomas. One of these has been appointed a Deputy Collector and another a Sub-Deputy Collector. Two students have been sent to the Cornell University in America for further scientific and practical training. The four students sent to America in 1905 returned in December 1907. The services of one of them have been placed at the disposal of the Government of Eastern Bengal and Assam;

and the other three are employed at the Provincial Agricultural College. Favourable reports continued to be received in respect of the students still in America.

The syllabus of agricultural teaching framed in 1906-07 has been introduced in the agricultural classes attached to the Cuttack Ravenshaw College and elsewhere.

The officers of the Agricultural Department should continue their endeavours to draw the attention of local bodies, private zamindars and others to the importance of disseminating the results of agricultural experiments and of introducing improved methods of cultivation.

9. *Publication of agricultural information.*—A quarterly journal of agriculture was started with the object of making known to the Agricultural Associations and to the public generally what is being done by the Department, and four issues were published during the year. Twelve leaflets, on various subjects connected with agriculture, were prepared and widely circulated. The Department also published a list of local names of varieties of sugarcane, and issued, for the use of local officers, a statement showing the normal areas under the principal crops in each district and the percentage of these areas to the normal nett-cropped area of the district. An agricultural survey of the varieties of wheat grown in this Province was completed during the year, and the results have been published as Departmental Record No. 2. A survey of soils has also been made by Mr. D. N. Mukharji, the results of which will shortly be published.

10. *Agricultural Associations, Fairs and Exhibitions.*—With the establishment of the Bhagalpur Association in May last, there is now a Divisional Agricultural Association in each Division. The Lieutenant-Governor is pleased to learn that the Patna and Orissa Divisional Associations continued to do good work, and that the Burdwan Association made great strides under its President, Mr. S. L. Maddox. His Honour has also read with much pleasure the account given in paragraph 56 of the Report of the useful work done by several members of Divisional and District Associations. The agricultural shows and fairs held during the year, of which a brief account is given in Appendix IV to the Report, received grants-in-aid from Government aggregating Rs. 7,050.

11. *Indigo and Sugar.*—The indigo research work, aided by a Government grant of Rs. 50,000, was continued. The staff, in spite of unavoidable changes in its *personnel*, did good work and received the thanks of the Bihar Indigo Planters' Association. The research station was visited during the year by His Honour the Lieutenant-Governor, the Hon'ble Mr. R. T. Greer, C.S.I., Member of the Board of Revenue, and the Inspector-General of Agriculture in India.

Mr. Percy Jones, of Benipur Factory, who has for some time been experimenting with a cane-crushing mill and two *rab*-making appliances supplied by the Agricultural Department, worked the system at a profit of Rs. 2,365, and he expects larger profits this year.

12. In conclusion, the Lieutenant-Governor wishes to place on record his appreciation of the services rendered by the Hon'ble Mr. Oldham, who began the organisation of the Department and by Mr. Gourlay, his successor, for their administration of the Department during the year. Mr. F. Smith, Deputy Director of Agriculture, continued to work with his usual zeal and energy. Mr. N. N. Banerjei, the Director's Personal Assistant, did good work in connection with the quarterly journal, the editing of which was almost entirely in his hands.

ORDER.—Ordered that the Resolution be published in the *Calcutta Gazette* and that a copy of it, with a copy of the Report, be submitted to the Government of India.

By order of the Lieutenant-Governor of Bengal,

F. W. DUKE,

Offg. Chief Secy. to the Govt. of Bengal.

No. 4299.

COPY, with a copy of the Report, forwarded to the Appointment Department of this Government for information.

By order of the Lieutenant Governor of Bengal,

A. H. LEY,

Under Secy. to the Govt. of Bengal.

CALCUTTA,
The 11th November 1908.

B. S. Press—12-11-1908—4627C—776—R. G.

REPORT

GOVERNOR OF
14. JAN. 1910

OF THE

AGRICULTURAL DEPARTMENT, BENGAL,

For the year ending 30th June 1909.

CALCUTTA:
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DEPARTMENT OF AGRICULTURE, BENGAL.

No. 9271A.

FROM W. R. GOURLAY, ESQ., M.A., I.C.S.,
Offg. Director of Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE,
LAND REVENUE DEPARTMENT,

Dated Calcutta, the 20th October 1909.

SIR,

I HAVE the honour to submit herewith the fourth Annual Report of the Agricultural Department, Bengal, for the year ending 30th June 1909. I regret the report is four weeks overdue.

I have the honour to be,
SIR,
Your most obedient servant,

W. R. GOURLAY,
Offg. Director of Agriculture, Bengal.

REPORT

OF THE

AGRICULTURAL DEPARTMENT, BENGAL.

For the year ending 30th June 1909.

CHAPTER I.

ADMINISTRATION.

Charge.—Throughout the year, the administration of the department was under my charge. Mr. Smith, the Deputy Director, held charge of the Agricultural stations with the exception of sabaur, which is managed by Mr. Dobbs. There was one change amongst the three expert officers stationed at Bhagalpur. Mr. Corbin, the Agriculturist, was transferred to the Punjab on the 24th August 1908, and his place was taken by Mr. A. C. Dobbs. Messrs. Taylor (Agricultural Chemist) and Woodhouse (Economic Botanist) completed their training, the former at Pusa and the latter at Poona, and they spent the year in organising laboratories and training Assistants preparatory to taking up their quarters at the Provincial Agricultural College at Sabaur, which is still under construction. Mr. Taylor did much useful work in analysing samples of manures and soils for the Deputy Director and the general public, and he commenced a special line of research in connection with sugarcane. Mr. Woodhouse made a collection of specimens of the field crops, fruits and flora of the Province. This work besides being useful for the College Museum, gave the Economic Botanist an opportunity of obtaining a personal knowledge of the agriculture of the Province. Mr. N. N. Banerjei acted as Personal Assistant to the Director throughout the year.

2. *Organisation.*—The other officers to the department consist of four Assistants, who are being trained for teaching work in the College, two Travelling Inspectors, seven Superintendents or Overseers in charge of Agricultural stations, six Inspectors of Agriculture (one deputed to each Division of the Province), an Assistant Mycologist, and an Assistant Entomologist. Of the four Assistants who are being trained at Sabaur, three are students who have lately returned from Cornell, United States of America, after a training in Agriculture at the University there. The fourth is a graduate of the Calcutta University specially recommended as an Assistant to the Economic Botanist by Professor Mahalanobis. One of the Cornell University students has been deputed to Pusa to be trained under the Imperial Entomologist for the post of Professor of Entomology. Babu Nibaran Chandra Chowdhury acted as a Travelling Inspector throughout the year and did good work. The best of the Agricultural Inspectors were Mr. Rout in Orissa, and Babu Arun Prakas Chowdhury in Patna. Of the Farm Superintendents and Overseers, Babu Kishory Mohan Ghose at Dumraon, and Babu Raj Nath Roy at Cuttack deserve special mention. The Assistant Mycologist and Entomologist worked throughout the year under the Imperial experts at Pusa.

Two more students returned from Cornell University in December last. Both were offered employment as probationers in the Department—one of them accepted and will be employed at Bhagalpur.

Babu Upendra Nath Sen, a 1st grade Overseer of the Public Works Department, was in charge of the Well-boring operations, and during the year was placed under the direct control of Mr. Dobbs with head-quarters at Sabaur.

3. The organisation of the department is still incomplete. The proposals for the creation of an Indian and Provincial Agricultural Service were returned by the Government of India for reconsideration. Further proposals in accordance with the modifications suggested by the Government of India will shortly be submitted. Messrs. Martin & Co., to whom the contract for the

Provincial College at Sabaur was entrusted, expect to complete their buildings early in 1910. The work of fitting up the Laboratories and furnishing the College will probably occupy six months and arrangements are being made to commence teaching in November 1910.

4. One aim of the department is to establish an Experimental station of 100 to 200 acres, representative of each of the six agricultural tracts of the Province, namely, Bihar, Bhagalpur, the Chota Nagpur plateau, the Gangetic alluvium, the Laterite tract and Orissa. We have at present two stations in Bihar, viz., Dumraon and Bankipore, one station at Bhagalpur, namely, Sabaur. The Chinsurah and Burdwan stations are representatives of the Gangetic Alluvium, and the Cuttack station is representative of the irrigated area in Orissa. A suitable piece of land was obtained near Kharagpur (Midnapore) representative of the laterite area, and preliminary arrangements were made for the acquisition of 150 acres of land near Ranchi in Chota Nagpur, but owing to the present financial stringency both these projects have been postponed.

In addition to the stations mentioned above, a small farm is maintained at Chaibassa (Singhbhum) for the collection of information concerning and experiments in connection with the production of *tassar* cocoons. The Deputy Director supervises the work of the farm at Kalimpong (Darjeeling) towards the up-keep of which the Government contributes.

5. The two small areas in Berhampore and Purnea, which were maintained for the production of jute seed were given up. Their object will be better attained at Chinsurah and Burdwan. Work at Frasergunge was stopped owing to the uncertainty of the future and the difficulty of supervision.

6. During the year a new branch was added to the department. The Committee which was appointed by Government to enquire into the causes of the decline of the silk industry in Bengal, recommended that work in connection with the improvement of Sericulture should be managed by the Director assisted by a Committee of silk experts. This Silk Committee which holds its meetings quarterly at Berhampore, consists of four silk experts (representatives of the European and Indian silk firms), and is presided over by the Director of Agriculture, or in his absence by the Collector of Murshidabad. The Committee were fortunate in retaining the services of Babu Apurva Kumar Ghosh as Superintendent of the work. Babu A. K. Ghosh was trained in Sericulture by the late Mr. N. G. Mukherjee, and has had extensive experience as Superintedent under the old Non-official Committee. Through his energy a Mulberry Farm of 25 acres with a Central Nursery consisting of five rearing houses and other buildings has been set up at Berhampore. The nine model nurseries belonging to the old Non-official Committee were taken over and maintained, and five new nurseries, three in Murshidabad, one in Birbhum, and one in Midnapore, are in process of construction. These institutions will supply the villagers with seed guaranteed free from disease, and the Committee hope that their efforts will result in the revival of silk culture amongst the people of Lower Bengal.

At Berhampore the sons of rearers are trained in the use of the microscope, for the purchase of which advances are made, and the villagers are encouraged to open independent nurseries on scientific lines. The private Sericultural school at Sabang in the district of Midnapore has fallen on evil days. The department assisted it with a grant of four scholarships of Rs. 5 each per mensem tenable by *bonâ fide* sons of rearers, and presented a microscope and other materials. It is possible that the interest taken by the new branch of the department may stimulate the school to further efforts.

7. Shortly after this department was expanded the Lieutenant-Governor nominated certain gentlemen as members of the Bengal Provincial Agricultural Association. This body meets quarterly in Calcutta to discuss agricultural problems connected with the Province and to advice the Director of Agriculture. Each Division (with the exception of the recently created Tirhut Division) has a Divisional association the original members of which are nominated by the Commissioner who presides at the meetings and now there are small Associations in each district (with three exceptions) presided over by the Collector. Some account of the work done by these bodies is given in a subsequent chapter.

8. *Tours.*—The Director spent 172 days on tour. This includes the time spent by him in December and January in holding a special enquiry in Champaran and also a visit to Simla to attend the Conference of Registrars of Co-operative Credit Societies. In August 1908 the Director accompanied the Inspector-General of Agriculture who made an extensive tour in the Province visiting all the Agriculture stations and being present at the laying of the foundation stone of the College of Sabaur. The Director's tours besides including visits to all the Agricultural stations included three visits to the Indigo Research Station at Sirsiah in Muzaffarpur and four visits to Berhampore to preside at the meetings of the Silk Committee.

9. The Deputy Director inspected the principal Agricultural stations, on an average once a month and he paid visits to Kalimpong, Frasergunge, Berhampore and Purnea. In the course of his tours he was present at the majority of the Agricultural Shows supported by the department including the Kalimpong *melâ*. With the permission of Government he spent two days in February at the Nagpur Exhbition. Wherever possible he was present at the meetings of the Agricultural associations.

Messrs. Dobbs, Woodhouse and Taylor spent short periods on tour visiting the Agricultural stations and Shows and being present at the Association meetings wherever possible in order that they might get a knowledge of the Agricultural conditions of the Province and come into contact with the members of the Associations.

The Personal Assistant, Mr. Benerjei, attended some Agricultural exhibitions and read papers at several association meetings. At all Agricultural shows and exhibitions of any importance Inspectors of the department were present.

10. *Miscellaneous.*—The District returns of the Preliminary wage census were received from the District officers in August. The statistics have been checked and compiled in the office but owing to the pressure of other work the Director was unable to write the report before the end of the year. The report will be ready shortly.

11. The request of the Inspector-General of Agriculture in India for a note on the soils of Bengal was carried out by Mr. D. N. Mukherjee last year. His report to which is attached an interesting map was published during the year and a brief summary of the information collected by him will be found in the Quarterly Journal of this department for July 1909. Several other notes were published including a compilation showing the seed time and harvest time of all crops grown in various districts of the Province of Bengal; a note on the cultivation of flax in Bihar (Departmental Record No. I); and a note on implements, manures and seeds written by the Deputy Director of Agriculture (Departmental Record No. II). These publications were widely distributed.

12. The usual annual season and crop report for 1908-09 was submitted on the 7th of June. The usual crop forecasts were prepared and published on the fixed dates. This year three forecasts of the Spring oilseeds were published in place of two as formerly, and four forecasts of the sessamum crop (Government of India's Order No. 454, dated 12th March 1908), and the third report on the Winter rice crop was issued in February in accordance with the Government of India's Order No. 733, dated 6th March 1908. The Weekly Weather and Crop Report, the Fortnightly Reports of the Wholesale and Retail Prices-current, the Annual table of the average wholesale prices and the numerous tables and charts connected with the statistics of rainfall were prepared and issued as usual.

13. The "Quarterly Journal of Agriculture" was regularly published during the year and the increase in the number of subscribers from 215 to 250 would seem to show that the publication is appreciated. As the journal is published in the English language, however, the articles are accessable only to the more highly educated members of the Agricultural associations. The publication of a vernacular journal on a more modest scale is under consideration.

14. The Director and the Deputy Director represented the Province at the fifth annual meeting of the Board of Agriculture which met this year at Nagpur from the 15th to 19th February. Mr. Woodhouse also attended as a special nominee of the Inspector-General.

CHAPTER II.

Special Enquiry and Experiment.

15. *Cultivation of Jute.*—The experiments in connection with jute on the lines laid down by the Inspector-General of Agriculture were continued at Burdwan. The bailers' valuation was obtained as usual, and in addition to this a large quantity of fibre of each kind of jute grown was sent to the spinners whose report was very satisfactory. In the opinion of the Deputy Director the experiments carried out at Burdwan conclusively prove that with care in cultivation and retting the Burdwan cultivator can produce from Naraingunge seed as good fibre as is to be found in Eastern Bengal.

16. The season was unfavourable for the jute experiment at Cuttack. Owing to the drought in March, April and May, the crop was entirely dependent on irrigation during these months. Insects so damaged the young seedlings that three sowings were necessary. The experience of last year has corroborated previous results. The best outturn has been obtained from the plot treated with 100 maunds of cowdung, four maunds of superphosphate, three maunds of kainit, two maunds of sulphate of ammonia and two maunds of magnesia per acre added with lime. These experiments are being continued.

17. The two jute seed areas at Purnea and Berhampore referred to in paragraph 22 of last year's report were abandoned. As already stated it was intended to transfer the growing of jute seed to Burdwan and Chinsurah, but it was hoped to obtain a crop from the lands in Purnea and Berhampore this year. At Berhampore, however, there was first a long period of drought followed by a period of flood which completely destroyed the crop. At Purnea the experience was the same, but 11 acres out of 30 sown were saved and 107½ maunds of good seed obtained.

18. The experiment with jute at Frasergunge was continued; 21 acres were sown with capsularis, but the low-lying land was found to be too salt, and though some seed germinated the crop died off in a very short time. A small plot on high ground did exceedingly well. Owing to the difficulties of communication the experiment at Frasergunge will not be continued but the little work which has been done would tend to show that jute can be grown at Frasergunge as soon as the land is properly sweetened.

19. The indigo planters of North Bihar have made no further progress with the growing of jute. The low price obtainable and the uncertainty of the season were not encouraging.

20. *Cotton Cultivation.*—At the Chaibassa Farm the experiment with *Buri Kapas*, an acclimatised upland Georgian variety, was continued on a small scale. The results partly owing to the drought were disappointing, and the Deputy Director is inclined towards the opinion that cotton cannot be grown successfully on a commercial scale in Bengal. The experiment, however, will be continued.

21. *Cultivation of Flax.*—Mr. Vandekerkhove, the Belgian Expert, continued his work at Dhooria in the Muzaffarpur District, and the results have been published separately by the Bihar Planters' Association under whom he is working. The Expert's report shows that a nett profit of Rs. 115 per acre was obtained over an area of 20 acres. In accordance with the arrangement previously reported the Department meets one-half of the Expert's salary, the Association meets the other half, and the Dhooria Concern takes all the risks of cultivation.

22. *Sugarcane.*—The Agricultural Chemist is conducting at Bhagalpur a series of experiments concerning the sugar-yielding properties of the canes of the Province, and specimens of the different varieties were collected for him from each Division. The Chemist's object is to test the possibility of obtaining an improved variety by chemical selection.

23. *Agricultural Stations.*—In Appendix I. will be found a brief account of the work done at each Agricultural station, a full report on each station containing the scientific record of the year is published separately.

CHAPTER III.

Agricultural Experiments in Government, Wards' and Private Estates.

24. The rains ceased very early and the continued drought which extended up to January 1909, rendered the season very unfavourable for the Winter and Spring crops.

25. *Potatoes.*—The results obtained in the estates were, on the whole, unsuccessful. Different individuals experimented with Naini Tal, Patna, Sylhet and Cherapunjee varieties. In Saran and in Narhan Estate in Darbhanga, the Naini Tal variety was grown successfully, and the Government tenants in Balasore succeeded with the Patna variety. The zamindar of Borasambar (Sambalpur) and some others have been successful with the Sylhet variety, and the Deputy Commissioner reports that the cultivation of potato is gradually spreading.

26. *Wheat.*—The season in Bihar was particularly unfavourable for this crop, but it is reported that some tenants in Kutlupur and Binda Diara in Monghyr, Babu Anadi Nath Ghosh at Colgong in Bhagalpur, and Babu Ganga Prasanna Ghosh in Champaran," found the outturn of Muzaffarnagar wheat greater than that of the local variety.

27. *Central Provinces Aus Paddy.*—The Manager of the Syedpur Estate in Khulna and Jessore reports that his tenants were successful with the fine variety of this paddy and that they obtained prizes for samples at the Khulna Exhibition. It was successfully grown also in the north of the Bhagalpur district, and the raiyats are reported to prefer it to the local variety as it withstands water-logging.

28. *Jaunpur maize.*—This variety proved suitable for the districts of Orissa, and was successfully grown in Khurda (Puri), Angul and Cuttack. A report from Saran states that it yielded an outturn 25 per cent. greater than that of the local variety.

29. *Ground-nut.*—This is another crop which is making headway with the tenants of Orissa, where the sandy soil appears particularly suited to its cultivation. The demonstrations at Khurda, Kothdesh and Balukhand in Puri district at Orora in Balasore and in Sambalpur were successful. In Angul the continuous rain in July and August damaged the crop. There was also a successful demonstration in the Syedpur Estate in Khulna.

30. *Cotton.*—Various individuals in different parts of the Province report that they have cultivated with more or less success small areas with *Buri Kapas* and Dharwar cotton, but nowhere has the cultivation been on a commercial scale.

31. *Jute.*—In the Orissa Division experiments were made in Balasore, Puri, Angul and Sambalpur. The crop was fairly successful in Balasore and Puri, but it failed in Angul. In Sambalpur where the crop was introduced for the first time, the results were encouraging. The season was unfavourable, but it appears that the crop suited to ordinary local conditions, and further trials will be made. A cultivator from Dacca was specially imported by the District Agricultural Association to teach the tenants the method of growing and retting. The experiments at Monghyr failed owing to the drought.

32. *Sugarcane.*—The *shamsara* variety was successfully grown at Chandkari in Khulna and the *khari* variety has been successfully introduced amongst the Government tenants in Sassaram.

33. *Other Crops.*—The tenants in Angul appreciated the *badshabhog* and *dadkhani* varieties of paddy, and an attempt will be made to introduce this more widely next year. An interesting demonstration with *dhaincha* for green manuring was carried out by the Subdivisional Officer of Madhepura in Bhagalpur, and was watched with interest by the tenants. Jubbulpore mustard was distributed in Monghyr. Ranchi and Palamau. In Kutlupur and Binda Diara in Monghyr, the cultivation was successful but it failed in Chota Nagpur. Some barley seed sent to Angul and Azmatgunge in Gaya produced a good crop. The Manager of the Siripur Farm of the Hathwa Estate in Saran reports an interesting experiment in connection with oats carried out under the instructions of Dr. Leather, the Imperial Agricultural Chemist. The object of the experiment was to ascertain the effects of manuring

with superphosphate and green manuring with cowpea compared with the effect of green manuring with cowpea alone. Superphosphate was applied at the rate of three maunds per acre. The plot manured with superphosphate gave an outturn of 63 per cent. greater than that of the other. The roots of the cowpea crop on the manured plot were found to have a much larger number of *bacteria nodules*.

CHAPTER IV.

Agricultural Education.

34. *Agricultural classes at Sibpur.*—The problem of agricultural education has not yet been solved in Bengal, and during the year very little was done. It was at one time hoped that the Provincial Agricultural College at Sabaur would be opened for teaching in 1908. Owing to the delay in connection with the plans and estimates it was early seen that nothing can be done before the beginning of the cold season of 1909. The College buildings will not be completed before the beginning of next year, and arrangements are being made to commence teaching in November 1910. Meanwhile arrangements were made for discontinuing the Agricultural classes at Sibpur College, and no student were admitted to the first year class in 1908. The second year class was attended by 13 students, of whom only 10 presented themselves at the Final Examination held in November 1908. Out of these seven obtained the diploma. The first student, in order of merit, received an appointment as Deputy Collector. As some of the unsuccessful students expressed a desire to continue their studies if a supplementary examination were held in November 1909, the Principal of the College very kindly arranged for this, and the supplementary examination was held on the 14th June and following days. Two candidates were successful.

35. Meanwhile with a view to securing some continuity between the agricultural teaching at Sibpur and the opening of the College at Sabaur, nine scholarships of Rs. 20 each per mensem were offered to students of the Province of Bengal to enable them to undergo a preliminary training at Cawnpore, Nagpur or Poona. Only four students, however, availed themselves of this offer. One is at present studying at Poona, two are at Nagpur, and one at Cawnpore.

36. Little progress has been made in promoting agricultural education in schools. The classes at Gaya, Dumraon, Hazaribagh and the Burdwan zillah schools and at the collegiate school at Cuttack, were continued; but until agriculture is a part of the regular curriculum it cannot be expected that the students will regard these classes except as a recreation. A Board of Examiners has recently been appointed in connection with these classes, and their first examination will be held during the coming cold season. Meanwhile, a text book suited to the requirements of school boys in Bengal is being prepared, and it is hoped that in another year it will be possible to do something towards creating an interest in agricultural education in the higher schools.

37. *Agricultural classes attached to the Collegiate School in Cuttack.*—The attendance on paper at least was better during the year, there being 75 students in the first class and 34 in the second; but as the session advanced and the compulsory studies took up the attention of the scholars, there was a great falling off. The boys, however, enjoyed the outing to the farm on Saturdays, and it is hoped that they benefited thereby.

38. *Agricultural classes at the Gaya Zillah School.*—In this school agricultural instruction was made part of the general routine of the school, and as many as 220 boys attended the lectures, while 80 did practical work in the school garden. The boys appeared to take considerable interest in the work.

39. *Agricultural classes in the Dumraon High School.*—In this school 74 boys attended the lectures, and 30 took part in the practical work, but the plan selected for the school garden is not very suitable. The students were occasionally given an outing to the agricultural station and this they appear to enjoy.

40. *Agricultural classes in the Hazaribagh Zillah School.*—There were 24 boys on the roll, but their attendance at lectures and practical work was not satisfactory, and very little real instruction was given.

41. *Agricultural classes in the Burdwan Municipal School.*—In this school too the attendance was not very regular. The syllabus prescribed by the department was followed, and the teaching appears to have been suitable. There were 19 scholars in the 1st class and nine in the second. The students were taken for their practical work to the agricultural station, but did little more than inspect the crops.

42. *Deputation of students to America.*—As the supply of students deputed to the Cornell University for further training was likely to exceed the immediate demand, considering the present rate of development of the department, and also as it seemed doubtful whether a training under American conditions was entirely suitable for this country, the Director discontinued the practice. The two students who were deputed in 1906 returned in December 1908. Both were offered posts as probationers, but only one accepted the offer. The two students deputed in 1907 are expected to return in December this year. The reports received from Dr. Bailey, the Director of the agricultural section of the College, concerning the work of the students, continue to be satisfactory.

43. *Deputation of students to the Pusa Agricultural Research Institute.*—Babu Kali Prasanna Ray, M.A., Assistant to the Agricultural Chemist, was deputed to Pusa for training in the laboratories there, and Mr. H. L. Dutt, one of the Cornell University students, who returned a year ago and who is at present a probationer in the department, was deputed to work under the Imperial Entomologist with a view to qualifying himself for the post of Professor of Entomology in the College at Sabaur.

44. *Miscellaneous.*—The practice of having student cultivators working on the farm at Cuttack was continued, and seven young men, mostly sons of cultivators, worked on the farm during the year. Mr. A. C. Sen, M.R.A.C., retired District and Sessions Judge, who has been interested in the Agricutural Department since its commencement, was kind enough to undertake an experiment in holding classes for cultivators. He delivered a series of popular lectures on the Agricultural station at Burdwan which were attended by cultivators from neighbouring villages, and the results seemed to be encouraging. The department is, however, not yet sufficiently organized to undertake a large camping in the agricultural education of the individual cultivator.

45. The Deoghur Agricultural Settlement, an institution organised by Babu Jogendra Chandra Ghosh (late Member of the Bengal Legislative Council) founded a small agricultural school on their estate. They built a small bungalow for the school and another as quarters for teachers and students. To assist them the Government sanctioned a grant of Rs. 60 per mensem for a period of two years for an agricultural teacher, and a lump sum of Rs. 200 to provide necessary apparatus for teaching. The success of the school, however, is not yet assured.

CHAPTER V.

SERICULTURE.

46. The work of the old non-official Bengal Silk Committee came to an end on the 30th of June 1908, and the supervision of the Superintendent and his staff was carried on by the Director until the first meeting of the new Committee appointed under Notification No. 3191, dated 17th August 1908. The work in connection with the improvement of sericulture is now conducted by a committee of four silk experts, three of whom are resident at Berhampore, which is the head-quarters of the Sericultural Superintendent. During the year four quarterly meetings were held, at three of which the Director presided. In accordance with the recommendation of the Committee of Enquiry, a central

nursery was established at Berhampore. The nursery consists of five rearing-houses, five cutting-out houses and one seed-house, besides quarters for the nurserymen, overseers, etc., and these buildings are surrounded by 21 acres of mulberry. Nine model nurseries established by the old Committee were taken over by the Department, and five new ones have been opened this year. The work is being gradually extended into the Midnapore and Birbhum districts. The old nurseries paid for their upkeep from the proceeds of the sale of guaranteed seed to the rearers. Seed has been supplied during the year to Mourbhanj, Belgaum, Poona, Baroda, Hyderabad, Ahmedabad and Eastern Bengal and Assam. The total receipts from the sale of seed amounted to Rs. 5,874.

47. Experiments are being tried with Italian and Japanese mulberry seed, and the results so far are hopeful. Experiments in connection with the cold storage of seed and cocoons were successfully carried out in Calcutta. The private sericultural school at Sabang had only four pupils during the year, and the results were hardly in proportion to the expenditure. With a view to improve the school, the Superintendent, when conducting the annual examination, discussed the future with the Secretary. The Managing Committee suggested that as the Department propose to open a nursery at Sabang, the Assistant Superintendent in charge should be asked to assist in the work of the school. The Managing Committee agreed to make over the school nursery and the small mulberry garden to the Department. The final fate of the school will be decided after the examination next year.

CHAPTER VI.

Publication of Agricultural Information and Supply of Seeds, Manures and Implements.

48. The following leaflets were prepared and vernacular translations widely circulated:—

(1) Simple notes on the common cattle-diseases of Bengal.

(2) Maize.

(3) *Juar* and fodder-crops in Bengal.

(4) A note on the preparation and packing of specimens of plants and insects.

Besides the Quarterly Journal, a compilation showing seed time and harvest time of crops grown in Bengal, a note on the cultivation of flax in Bihar, a note on implements, manure and seeds, and a note on the soils of Bengal by Mr. D. N. Mukerji were published and distributed. Reports on the several agricultural stations also were published and issued as usual.

49. The Central Seed Store issued during the year 1,579 maunds of seed (including over 400 maunds of potatoes), 667 maunds of manure and about 100,000 sugarcane cuttings. Paddy, both *aus* and *aman*, wheat and oats were largely distributed; bonemeal, castor-cake, superphosphate and saltpetre were the principal manures sold; 169 implements were distributed. The lease of the godown in Pollock Street expired, and as there was land available for the purpose on the site of the Agricultural School Farm at Sibpur (which has been abandoned since the class was closed), the store was removed to the other side of the river. A corrugated-iron shed has been erected for the seed, and the old class-room and overseers' quarters are being utilised for the office and seed-testing. At Sibpur there is ample space for the trial of implements, etc.

As soon as the work of seed distribution is properly organised, and it has been shown by the Department that there is room for private enterprise, it is proposed to hand over the business to a Calcutta firm of seed merchants.

CHAPTER VII.

Agricultural Associations and Shows.

50. *Provincial Association.*—Three meetings of the Provincial Association were held during the year. At the meeting in August it was decided that in future meetings should be held regularly in the first fortnight of April, August and December, corresponding with the *rabi*, *bhadoi* and *aghani* harvests. Those members who attend the meeting regularly have shown great interest in the proceedings, and it is hoped that in the future this Association will form a valuable consulting body for the Director.

51. *Divisional Associations.*—The Divisional Associations have shown much more life during the year, and some of them are developing into very useful bodies. The members of the Orissa Association have shown the greatest interest. The meetings are held twice or thrice during the year at the Agricultural station at Cuttack. The Patna Association have given the Department a great deal of assistance, and its energetic Secretary has stirred up within the Division much local interest in the work of the Department. The Bhagalpur Association, the most recently started of all, has made an excellent beginning, and promises to be of assistance in connection with the College, which is situated six miles from the Divisional head-quarters. One of the members, Raja Kamaleswari Prasad Singh of Monghyr, has given 15 acres of land at Khajra on the East Indian Railway for the purposes of demonstration. The Deputy Director has drawn up a scheme for this work, which will commence next week. The Burdwan and Presidency Divisional Associations have held one or two meetings during the year, but with a few notable exceptions, the members do not take much interest in the proceedings.

The annual grant of Rs. 1,000 was made to each Divisional Association, who made small grants to the different districts of the Divisions.

52. *District Associations.*—As the number of superior officers in the Department is very small, it had been impossible to have the Department represented at very many of the district meetings. The Divisional Inspector has as a rule been present, but more than this is required before much enthusiasm can be expected from the members. The Sambalpur Association, however, under the enthusiastic guidance of its President, Mr. A. N. Moberly, promises to be of great assistance to the Department. Individual members of Associations took up small pieces of demonstration work, and the reports received show that in many instances these were successful. Mr. Saroda Charan Mitter, late Judge of the High Court; Rai Lalit Mohan Singh, Raya Bahadur of Chakdighi, and Babu Purnendu Narayan Singh, the Secretary of the Patna Association, have been unsparing in their efforts to advance the cause of agriculture. The first two have carried out several important demonstrations on their estates and at their own expense for the benefit of their raiyats, while to the last-named gentleman is due the success of the Patna Agricultural and Industrial Show. In the Presidency Division the Manager of the Syedpur Trust estate in Khulna, Rai Kali Bhusan Ghosh Bahadur, Babu Troylakhya Nath Chatterjee of Ghatbhogh, Babu Jotindra Nath Basu of Jamalpur, and Babu Upendra Nath Purkait continued to take a practical interest in the work of the Department.

53. *Agricultural Shows and Fairs.*—Twenty-three agriculture and cattle shows in different parts of the province were attended by officers of the Department. Mr. Woodhouse has paid special attention to this branch, and he organised the successful exhibit of the Bengal Department at the Nagpur Exhibition. Mr. Smith visited a large number of shows and introduced a new feature by giving demonstrations of the work of the Department by means of a magic lantern. With a little further organisation these shows promise an excellent means for bringing the work of the Department to the notice of the cultivators. The exhibit organised by Mr. Woodhouse after the Nagpur Exhibition was over was set up at the Bankipore and Muzaffarpur shows. The smaller exhibits were taken round to the other shows by the Travelling Inspectors. Lectures were given by the Inspectors, the Entomological Assistant and the Deputy Director, and demonstrations of the use of improved implements were also arranged for. A brief account of each show

will be found in Appendix II. The Department contributed a sum of Rs. 6,522 in aid of the local show funds.

CHAPTER VIII.

Miscellaneous.

54. *Crop-cutting Experiments.*—In November 1907 the quinquennial report for the period 1902–07 was submitted to Government. Since then the returns have been compiled as usual, but the number of experiments has fallen off. Only 900 were received during the year 1907-08. The question of crop-cutting requires further attention before reliance can be placed on the results obtained, and an attempt to reorganise the system will be made in the near future.

55. *Mycology.*—The Assistant Mycologist, Babu Pramatha Nath Bhattacharjee, worked in the Laboratory of the Imperial Mycologist at Pusa, but accommodation will be provided for him immediately at Sabaur. The principal work of the year was the preparation of a series of lectures and demonstration slides for use in the College course in Mycology. Investigations on Rabarwilt and the smut disease of sugarcane have also been made. The only fungus disease of importance reported during the year was the *Bangiphutti* disease, which attacked the paddy crop in Sambalpur. The cause is obscure, and until the Imperial Mycologist has finished his investigation no definite remedy can be suggested.

56. *Entomology.*—The Assistant Entomologist, Babu Dhirendra Nath Pal, worked at Pusa in the Laboratory of the Imperial Entomologist. He gave lectures on insect-pests and methods of dealing with them at Bankipore and Singeshwar, and during the rest of the time has been engaged in preparing show cases for future exhibition and for the College course.

57. *Paddy-pests.*—In July 1908 the districts of Burdwan, Hughli and a part of Midnapore and Nadia were reported to have been attacked by rice fulgorids (*Liburnea sp.;* vernacular *Dhasa, Madupoka*) which were found to attack newly-transplanted *aman* paddy and *aus* paddy. The damage was reported to be as much as 25-50 per cent. on the borders of Burdwan and Hughli and 50 to 70 per cent. in the Meherpur and Tihatta thanas of Nadia. In Burdwan the local remedy was to besmear the plants of *aus* paddy with a paste of cowdung and stale urine, but this application was easily washed off by heavy showers. For *aman* lands Babu D. N. Pal found that an effective remedy was to pour kerosine into the fields at the rate of one bottle per bigha, after which a bamboo was passed over the plants to knock the insects on to the thin films of kerosine. Among other rice-pests cock chafers (vernacular *Gurja—Anomala varians)* attacked the roots of paddy plants on high lands in the Narail subdivision, Jessore. The cultivators were recommended to dig out the plants attacked and destroy the grubs, while the lighting of fires in the fields was suggested to attract and destroy the mature insects At Ranchi *Hymphula depunstatus* did some slight damage to paddy plants in standing water by making nests in the rolled leaves which were then cut off and floated on the water to the next plant, but Babu D. N. Pal found that the insects could be collected and destroyed by dragging a cloth across the infected fields. In addition, paddy leaf-rollers (*Cnaphalocrocis medinalis*) were reported from Midnapore and the rice hispa (*Hispa œnescens*), the rice hairy caterpillar (*Dasychira sp.*), and the rice bug (*Leptocosiœ varicornis*) were also reported as minor pests of paddy.

In June 1909 "army worms" were reported in two thanas of the Ranaghat subdivision, Nadia district, but they had disappeared before Babu D. N. Pal reached Ranaghat, and the only rice-pest found in the locality was the rice stem-borer (*Chilo sp.*), the remedy for which was demonstrated by Babu D. N. Pal. At the same time the late-sown *aus* paddy in Magura subdivision, Jessore, was found to be attacked by caterpillars, which also, on account of more seasonable weather, had disappeared before Babu D. N. Pal arrived, so that he had to be content with showing

the cultivators the method of checking such pests by dragging a rope moistened with kerosine over the affected fields.

58. *Jute-pests.*—The jute semilooper (*Casmophila sabulifera*) was found to be doing slight damage in Jessore, and the jute stem weevil (*apcon sp.*) was found to be doing damage on the Chinsura farm. On the Purnea jute seed farm red spiders were found to be doing considerable damage, and dusting with powder of sulphur was recommended as a preventive measure. The leaf miner (*Trachys sp.*) was also found in jute leaves throughout the jute-growing area.

59. *Potato-pests.*—In May 1909 the potato tuber moth (*Pthorinea op-perculekla*) was reported to be causing damage, ranging from 50 to 75 per cent. of the stored potatoes in Patna city and the neighbourhood; the seriousness of the attack will be appreciated if it is understood that Patnais at large potato-producing district, and is also a centre of trade in seed pottaoes. It was found that the country method of storing potatoes in open baskets greatly assisted the spread of the disease; and so a godown was rented by the Divisional Agricultural Association and a demonstration of the method of storing potatoes in sand to prevent the moth returning to lay eggs on the tubers was commenced in accordance with the recommendations of the Imperial Entomologist.

60. The Agricultural Department is much indebted to Messrs. Butler and Lefroy who have always readily given any assistance asked for. Babu D. N. Pal and the Imperial Entomologist's Second Assistant prepared a Bengali revision of the work on Indian Insect-pests under Mr. Lefroy's guidance. Sanction to the publication of this work by the Department has been received. The Department is further indebted to Mr. Lefroy for the colour plates of insect-pests supplied, especially for the two plates showing the life-history of the *tasar* moth, which were published in the report on the *Tasar* farm and in the Bengal Quarterly Journal. Mr. Lefroy has further favoured the Department with the memorandum on the insect-pests reported to him from Bengal, which is printed in the appendix.

61. *Indigo.*—The whole question of the assistance of indigo research by Government was under consideration during the year, and it was decided to make an annual grant of Rs. 32,500 for five years to the Behar Indigo Planters' Association for the continuation of the work on condition that the Association subscribe themselves Rs. 10,000 annually to the cost of research. The Association have been fortunate in securing the services of Mr. Bergtheil, who has resigned his post as Imperial Bacteriologist in order to complete his research work in indigo under the Association.

The main aim of Mr. Bergtheil is to improve the indigo plant by selection, and to study the causes which lead to the production of Indican with a view to evolving some method of stimulating its production.

A full account of Mr. Bergtheil's work under the Sirsia Committee will be found in the appendix to this report. The services of Mr. Brigg and Mr. McGregor were no longer required, and they have been permitted to take up appointments elsewhere.

The Sirsia Committee of the Behar Planters' Association continued to supervise the work of research, and during the year published the following reports—

(1) Application of strong sulphuric acid, "Mal Boiling" and seed treatment (Bergtheil).
(2) Selection of Java indigo plant for seed-bearing (two reports: Bergtheil).
(3) Production of Java indigo seed in Behar (two circulars: Filgate and Bergtheil).
(4) Fourth annual report of the Sirsia Sub-Committee.
(5) Mr. Bergtheil's reports for 1908 and 1909.
(6) Note on the purchase of Java seed (Filgate).
(7) Fifth report of the Sirsia Sub-Committee.
(8) Proceedings of the Sirsia Committee meetings.

The Java Natal indigo-seed farms proved unsuccessful, and were abandoned during the year. The Sumatrana seed farm at Dasna, in the

United Provinces, which is managed by Mr. R. E. Flavell, produced 2,376 maunds—more than twice as much as last year.

62. *Arboriculture.*—The supervision of arboricultural work on the roads in Bengal has not received from this Department the attention it deserves during the last year, but steps will be taken to make the supervision more efficient. The class for the training of overseers, etc., in arboriculture was held by the Curator from the 12th August to the 13th September. The Superintendent, who supervises this work, informs me that 19 overseers from 18 districts attended the course, and they gave diligent and intelligent attention to the lectures and demonstrations. So far as he was able to judge, all left the course with a clear understanding of the subject of arboriculture.

63. *Well-boring Operations.*—Through want of experience and proper supervision the work of organising a system of well-boring has not made so much progress as was anticipated. The Superintendent at Bankipore required more supervision than the Director could give, and the work has lately been placed under the Principal of the College, the head-quarters of the Superintendent being removed to Bhagalpur. During last year a large number of borings were made independently of the Department by the District Board of Muzaffarpur under the guidance of Mr. Temple. The results of these have been recorded and placed at the disposal of the Department, and the experience gained at Muzaffarpur will prove most valuable.

64. *Rainfall Stations.*—During the year 21 new stations were opened in the following districts:—24-Parganas (1), Shahabad (4), Saran (3), Muzaffarpur (9), Palamau (3) and Manbhum (1). The statement below gives the number of rainfall stations in each district and the number inspected during the year. In some districts inspections are few and far between:—

Names of districts.	Number of rain-gauge stations.	Number of rain-gauge stations inspected.	Names of districts.	Number of rain-gauge stations.	Number of rain-gauge stations inspected.
Burdwan ...	5	...	Monghyr ...	10	4
Birbhum ...	6	...	Bhagalpur ...	8	...
Bankura ...	10	8	Purnea ...	7	2
Midnapore ...	27	1	Darjeeling ...	6	...
Hooghly ...	3	2	Sonthal Parganas ...	21	2
Howrah ...	4	3	Cuttack ...	8	1
24-Parganas ...	10	3	Balasore ...	10	...
Nadia ...	6	4	Angul ...	5	1
Murshidabad ...	10	3	Puri ...	9	...
Jessore ...	5	3	Sambalpur ...	3	3
Khulna ...	12	8	Uriya Feudatory States	7	...
Patna ...	8	3	Orissa Tributary Mahals	18	...
Gaya ...	11	3	Hazaribagh ...	8	5
Shahabad ...	16	3	Ranchi	10	4
Saran ...	13	1	Palamau	20	2
Champaran ...	8	2	Manbhum ...	10	3
Muzaffarpur ...	16	...	Singhbhum ...	12	9
Darbhanga ...	11	2			

65. *Agricultural Museums.*—Some progress has been made in the different branches in the collection of materials for the College Museum, but the work cannot be taken up in earnest until the College building is handed over to the Department.

66. *Agricultural Implements.*—In Appendix V is given a table of agricultural implements reported to have been tried in the Province during the year. It is hoped to reorganise the implement department of the seed store, so that a large stock of implements recommended will always be ready for sale. Messrs. Burn and Company sold 29 sugar-mills of the Behia type, one winnower, eight chaff-cutters, and two bullock-gears; Messrs. Jessop and Company sold 77 Hindustan ploughs, 37 chaff-cutters, 15 corn-cutters, 3 cultivators, 3 winnowers, and many other smaller implements.

67. *Officers of the Department.*—During the year the Deputy Director has worked with his usual energy; Mr. Dobbs has given great assistance in all matters connected with the College; Mr. Woodhouse's work in connection with the shows had been specially valuable; and Mr. Taylor has rendered the Deputy Director much service in the analysis of soils; Babu A. C. Ghosh has shown great energy in carrying out the sericultural work, and Messrs. Dutt, Sil and Ghosh, the Cornell students, have settled down to their work. Of the Travelling Inspectors, Babu Nibaran Chandra Chowdhury, the oldest officer in the Department, has done good work in spite of indifferent health; while of the Divisional Inspectors, Babu A. P. Chowdhury in Patna and Mr. Rout in Orissa have done best. Babu P. N. Bhattacharjee and Babu D. N. Pal are reported to have worked at Pusa with assiduity. Of the Farm Superintendents, the Deputy Director speaks highly of Babu Kishory Mohan Ghosh in Dumraon and Babu Raj Nath Ray in Cuttack. My Personal Assistant, Mr. N. N. Banerjei, assisted by Babu Rajendra Lal Banerjei, has rendered valuable assistance in connection with the Quarterly Journal.

APPENDIX I.

Agricultural Stations, 1908-09.

Burdwan.—At this station the work on paddy, jute and potatoes on the lines of the previous years was continued. Full details will be found in the Annual Report of the station. From an agricultural point of view the season was excellent for jute, as there was sufficient rainfall from May to September, but it was unfavourable for paddy owing to the early cessation of the monsoon and precarious for sugarcane, the first four months and the last three months of the year being practically rainless. All unirrigated *rabi* crops were precarious owing to the drought. An exhaustive summary of the results of the paddy experiments at this station was made in the Annual Report for 1906-07, and at present there is nothing further to add to what was then reported. During the year our energies have been concentrated on the jute crop, and we are now in a position to draw a few definite conclusions of practical value. Jute is a gross feeder, and the fact that the crop produces 600 maunds or 22 tons of green plant per acre in three months demonstrates the necessity of a plentiful supply of water and available plant food during its period of growth. From 600 maunds of plant per acre only 30 maunds of fibre are obtained showing that the fibre makes up only 5 per cent. of the total crop. Accordingly the refuse should be returned to the land as far as possible, so that unnecessary impoverishment of the soil may not take place. In addition to the bailers' valuations which have always been made on small samples we have obtained the opinion of the spinners on much larger quantities and the results are very satisfactory. It is now conclusively shown that the Burdwan district can produce fibre equal to good Naraingunge jute. The employment of Naraingunge seed is necessary, and as this cost very little it is well within the power of every cultivator. An increase in the demands of the trade can be easily supplied from the present area under jute. Manuring is little practised and artificial manures are as yet unknown. The present average outturn per acre is 15 maunds, whereas with judicious manuring 30 maunds can be expected.

In addition to the above the following noteworthy results have been obtained at this station:—

(1) Jute and paddy in rotation suit the Burdwan district.
(2) The rotation of jute and potatoes is an excellent practice for this district.
(3) Three maunds of bonemeal *plus* one maund of saltpetre is an economical manure for paddy.
(4) Green manuring with *dhaincha* is an economical practice in paddy cultivation.
(5) Twenty maunds of castor-cake is an economical manure for potatoes.

The total expenditure during the year amounted to Rs. 4,381-0-11 and the receipts to Rs. 2,409-8-3 as compared with Rs. 5,116-8-5 and Rs. 1,587-11-6, respectively, in the preceding year. The cost of up-keep of this station is generously borne by the Maharajadhiraj of Burdwan to whom the Department is indebted.

Dumraon.—Sugarcane is the chief crop under observation at this station while paddy, mustard, oats, wheat and *rahar* are receiving attention. From an agricultural point of view 1908-09 was a very unfavourable year. All crops suffered from a deficient rainfall and recourse was had to irrigation from the canal, wells or tanks. The *khari* variety of sugarcane maintained its superiority over other varities, while 200 maunds of cowdung *plus* 8 maunds of castor-cake per acre as a manure and the trench system of planting have proved superior to the local practices of manuring and planting, respectively. The *khari* variety has only a thin cane and taking equal areas of the same size of canes of *khari* and Mauritius or Shamshara an outturn of only 70 maunds of *gur* per acre is obtained from the former, while 100 to 120 maunds of *gur* might be expected from the latter. Yet owing to the greater care necessary to obtain such a crop from the Mauritius and Shamshara varieties, the larger demand they make on the water supply, their liability to fungoid and insect pests and their greater attraction for jackals and pigs it is difficult to obtain even 20 maunds of *gur* per acre from the thicker canes. Where a constant supply of water can be applied chiefly all the year round and pigs and jackals are successfully excluded Mauritius, Java and Shamshara varieties of canes may be tried. For general use, however, we recommend the *khari* variety.

In agreement with the results of previous years the local varieties of paddy continued to prove equal to other varieties, while green manuring with sun hemp and *dhaincha* proved an economical practice. The Raipore and Jubbulpore varieties of mustard were again more prolific than the local variety of Shahabad. During the year under report we recommenced experiments with wheat and found that the Muzaffarnagar white variety which we recommend for Bengal was able to maintain its position. Seed from Cawnpore from which our supplies are obtained was as prolific as Mr. Howard's from Pusa, but the best results were obtained from the Hybrid Bansi variety of Hoshangabad (Central Provinces). Manuring with 2 maunds of saltpetre *plus* 50 maunds of cowdung per acre which gave excellent results in the Central Provinces proved to be economical. These experiments will be continued. Dumraon oats again demonstrated their prolificness.

The total expenditure at this station during the year was Rs. 2,659 and the receipts Rs. 1,495-0-6 as compared with Rs. 3,125-1-5 and Rs. 702-3-0 in the previous year. The expenses of this station are borne by the Dumraon Raj estate, which is now under Court of Wards, but the entire management is in the hands of the Department of Agriculture, Bengal.

Cuttack.—The principal crops grown during the year were paddy, jute, potatoes and ground-nut. The season was unfavourable for sugarcane, *rabi* crops and jute but favourable for paddy. The total rainfall was up to the average but the distribution was unsatisfactory. Nearly all the rain fell between June to August while the remainder of the year was very dry. There was practically no rain in 1908 before May 22nd. The sugarcane was therefore dependent on canal water. Unfortunately the canal had to be closed during April for repairs. The sugarcane crop of the district was therefore a poor one and in many cases a failure. On the farm we were able to give a partial watering from one of our tanks and this saved the crop from dying but the total outturn was very considerably affected by the drought.

The jute sown in April was a failure; the only shower being followed by three weeks of drought. The plants were stunted and fell an easy prey to insects.

The high land was dry by the middle of October and for nearly four months there was not a drop of rain. This proved fatal to the *rabi* crops, because the canal was closed for deepening on January 1st, 1909, and lift irrigation is uneconomical except for choice vegetables on select plots of the farm. Potatoes were a partial failure due to drought. The year was favourable for the ground-nut crop. The original object of this farm was to prove the advantages and economy of canal irrigation in Orissa and it may be noted that during the past year without irrigation only paddy and ground-nut crops were possible. Jute, sugarcane, potatoes, and all *rabi* crops failed or were uneconomical without canal irrigation. This station has lately been increased in size and is now regarded as the Experimental station of the Department representative of the Orissa Division. The most striking results of the year have been that the best quality of jute fibre equal to best Naraingunge can be grown in Orissa; that jute can be grown in rotation with paddy in one year; that jute can be grown in rotation with potatoes in one year; that the meston plough is an excellent plough for paddy cultivation (an outturn of 45 maunds of grain and 83 maunds of straw per acre being obtained); that green manuring with *dhaincha* is an excellent manure for paddy (40½ maunds of grain and 61 maunds of straw being obtained per acre); that Central Province *aus* paddy, which is ready for harvesting in the first week of September is well suited to Orissa conditions—an outturn of 27 maunds of grain and 85½ maunds of straw per acre being obtained—that the *khari* variety of sugarcane from the Lower Bengal and the *mungo* variety of sugarcane from Shahabad (Bihar) are well suited to Orissa (an outturn of over 70 maunds of *gur* per acre may be expected); and that ordinary Calcutta bazar ground-nut (*chinabadam*) grows exceedingly well in Orissa (an outturn of 20 maunds of unshelled nut per acre may be expected). The following students received practical training on this station:—

(*a*) 3 Sibpur Agricultural students;
(*b*) 116 Ravenshaw College (Cuttack) students; and
(*c*) 7 Student cultivators.

The student cultivators come at their own expense or through the help of private gentlemen. They are deputed to work on the station and gain practical experience of the methods followed. They are paid for their labour and provided with free quarters.

During the year under review the total expenditure of the station came to Rs. 7,499-0-4, while the amount of money paid into the treasury for farm produce sold, amounted to Rs. 5,270-5-3. In addition to this at the end of the year (April 1st, 1909) there were bills recoverable and stock in hand to the value of Rs. 3,090-8-9. The station was therefore self-supporting. The charges on account of this station are borne by Government.

Bankipore.—This station has an area of 210 acres. The land was taken over by the Agricultural Department on the 18th May 1906 and work commenced in November of that year. Since that time up to the present work has consisted in fencing the area, laying out the farm, erecting necessary buildings, growing seed for seed distribution and preparing land for experimental work. Although we have commenced a tentative experimental cropping scheme this year, we have not yet obtained uniform conditions and we must wait till the Winter of 1909-10 before taking up further permanent improvements to obtain these uniform conditions. In spite of this, however, we have already obtained many useful practical results that are worth recording. In the Winter of 1906-07 it was proved that excellent vegetables could be grown on this station: Tomatoes, beet, cabbages, caulifflowers, kholrabi, turnips and radishes grow well in field cultivation. In 1908-09 we carried out an interesting experiment in connection with the problem of fodder supply in times of famine. We built a silo (*pucka*) and filled it with green *juar* (chopped coarse) in September and October of the year 1908. The silo was opened on the 1st April 1909 and has provided wholesome fodder throughout the whole of the hot dry season of 1909. Not only is the Chemist's analysis of the ensilage satisfactory but the bullocks eat the fodder with avidity and their condition at the worst season of the year, viz., just after the dry hot weather and when the heavy work of ploughing in puddle is completed was all that could be wished for. The cost of the Circular silo which has inside measurements of 19½ feet diameter and 24 feet

height the thickness of the wall being 25 inches, was Rs. 1,628 and the capacity 3,750 maunds green *juar*. From this quantity of green *juar* stored, 2,232½ maunds have already been consumed and one-fourth of the silo is still full. The total ensilage should therefore amount to at least 3,000 maunds.

At this station there is an orchard of 7 acres and in May and June 1909 all our trees were laden down with fruit, such fruit and such a crop have been very rare this year in Bihar. The reason for this success while so many orchards failed was that during the winter of 1908-09 the land beneath and round the trees was cultivated and irrigated.

Other crops worthy of note are: field peas, 12¾ maunds per acre in 1908-09; gram, 15½ maunds per acre after jute, gram 5 maunds per acre after transplanted paddy, 25 maunds of paddy grain per acre in 1908-09; *juar*, 17 to 19 tons of green *juar* per acre in 1908; *juar* for seed 12 maunds seed per acre 1908 and Jaunpur maize 30 maunds (cobs) per acre. The expenditure during the year amounted to Rs. 17,239-4-6½ and the receipts to Rs. 1,271-6-2. The charges on account of this station are borne by Government.

Chaibassa Tassar Farm.—The total area of the farm is 54 acres, of this 31 acres are under cultivation and the remainder is made up of roads, buildings, hillocks and tank. Most of the land is high and unsuitable for crops. There is, however, a little terraced rice land.

Tassar rearing was continued. The rearing season 1908 was unfavourable for *muga*, *jata daba* and *daba* crops while for the *larya* and *bugui* crops or bunds which come later the season was favourable. *Buguis*, in particular, were so abundant that they were purchaseable at Rs. 3 per *kahan* in the market. Although the amount of rainfall was fairly normal the heat of May and June 1908, due to the monsoon breaking late in June, was great, and prevented many of the eggs of the *muga*, *jata daba* and *daba* moths from hatching out. Those that did hatch out throve fairly well and gave a good *ampatia* crop of flimsy cocoons. It was in the second cycle or *barsati* crop of these cocoons however that the disaster took place. Everything proceeded normally till the end of the fourth moult in the third week of September. When after the heavy rain on the 20th September followed by a mist up to 10 A.M. on the 21st September, the worms were found dying in hundreds from grasserie. The worms just at the critical stage of moulting were unable to eat sufficiently and when they did feed they ate greedily of the wet leaf which caused the epidemic. Grasserie is a terrible scourge. The worms may appear to be thriving one day while on the next they are dying in hundreds. No variety of worm appears to be immune—*mugas*, the new cocoons from the forest—*Jata dabas*—the one year domesticated cocoons; *dabas*—the two or more years' domesticated cocoons; *laryas*—which come from the forest each year being equally affected. During the third and fourth moult the attack was worst but the *ampatia* or first crop and the *barsati* or second crop seem equally liable. The disease seems to coincide with unfavourable weather conditions such as continuous and excessive rains or heavy rains after drought, etc. It was thought that new stock from the forest would be more immune than semi-domesticated cocoons, but so far the disease has attacked the worms of every kind of cocoon equally and at present since the whole crop was destroyed in 1908 we are again at the first stage of the work, viz., that of the wild *mugas* from the forest. Unless a remedy for those attacks can be found the cultivator is likely to treat *tassar* rearing as a precarious means of livelihood.

On the lands not taken up by the *asan* and *arjun* trees which have been planted 20 feet apart, a few important crops are being grown: paddy, potatoes, ground-nut and cotton. The farm is situated on the same geological formation as represented by the gnessic table land of Peninsular India which represents half the present Province of Bengal. As this is the only station we have situated on the Metamorphic series of rocks, the soil is more than usually interesting. Owing to the barrenness of the soil, the high elevation of the land and the cost of irrigation no economical results worth publishing have been obtained.

As this is the centre of the supply of *buri* (*kapas*) cotton seed for the Province we are carrying out a manure experiment on 2 acres and 13 acres are set aside for plant to plant selection. But the outturn was very poor owing to early cessation of the monsoon.

The expenditure during the year amounted to Rs. 2,496-2-6 and the receipts to Rs. 163-3-0 compared with Rs. 3,505-7-6 and Rs. 225-1-0, respectively, in the previous year. The charges on account of this station are borne by Government.

Frasergunge.—The farm is situated on the Frasergunge Island just to the west of the condensing engine in north latitude 22 degrees and east longitude 88 degrees. It is about 100 miles south of Calcutta and is close to the Bay of Bengal. The land was cleared of jungle in 1907-08 and in 1908-09 the area was surrounded by an embankment and divided into equal sized plots 100 feet × 100 feet. Two sluice boxes were let into the embankment for drainage, a small house was built for the use of an Overseer and enough wire has been brought to fence the farm. Owing to the want of a suitable means of communication with the Island it was decided to defer further work for the present. In 1908 *capsularis* jute was sown on two blocks, side by side, the one was high land while the other was low land. On the low land the jute crop failed, while on the high land an excellent crop was obtained. An estimated outturn of 16 to 18 maunds of fibre per acre was grown, while the quality was recently valued as first class. Success on the high land is attributed to the fact that the salt had been washed out of the earth. Jute also grew exceedingly well on several small patches of high land near the raiyats' huts. In another block jute seed from Khulna (on land that is supposed to contain a fair percentage of salt) also failed to grow.

Kalimpong Demonstration Farm.—The St. Andrews Colonial Homes at Kalimpong, assisted by a subsidy from the Bengal Government opened a Demonstration farm at Kalimpong in April 1907 for the district of Darjeeling. Land has been acquired and

fenced. The farm has been laid out and the necessary buildings have been erected. The agricultural practices of this part of the Himalayas will now be tested and definite figures of the cost of cultivation of the chief crops with outturns per acre worked out. Although work has not been long in progress at this station already some interesting results have been recorded. Jaunpur maize which has given such excellent results on the plains seems quite unsuitable to hill conditions.

The following interesting results were also obtained in 1908-09 :—

(1) Local maize yielded 33½ maunds per acre—grown on rice terraces—unmanured and 7 acres in area (stalks not given).

(2) Buckwheat yielded 12 maunds grain and 29 maunds straw per acre.

(3) *Juar* yielded 12 maunds grain per acre (straw not given).

(4) *Kodo* yielded 13 maunds grain per acre (straw not given—generally fed off to bullocks).

(5) Wheat yielded 8 maunds per acre (straw not given).

(6) Paddy yielded 20⅔ maunds grain and 32⅔ maunds straw per acre.

(7) The Horatius corn sheller 1·58 (Montgomary ward) has given very satisfactory results. Shells 4 to 5 maunds of grain per hour, 9½ maunds grain from 20 maunds of cobs (with leaves round cobs).

In addition to ordinary crops a thorough test will be made with English fruit trees to find out their suitability for the Kalimpong Hills. Seedlings of the most important trees have already been obtained from the Royal Nurseries, Maidstone, England.

The Government subsidy is Rs. 5,000 per annum for five years.

Chinsurah.—The work of laying out the station has been pushed on during the year but is not yet completed. The expenditure was Rs. 15,335-6-3 and the receipts Rs. 138-5-9.

Sabour.—The laying out of the farm continued during the year. The exceptional drought caused considerable delay, as the staff could acquire no experience of normal conditions. The questions of drainage and levelling on which so much depends could not be dealt with. The laying out of experimental plots for rice and dry crops was begun and will be finished during 1909-10. The crops were unsatisfactory on account of the drought, and, with the exception of *rahar*, the outturn was less then 50 per sent. of an average crop. Some varieties of *rahar* selected by Mr. Sil, the Assistant Professor of Agriculture, gave a very good yield, and will be grown on a larger scale in 1909-10. A small area of sugarcane was grown for the Agricultural Chemist. Areas have been delimited for the Botanical garden, for botanical field work, for the compounds of the staff and for the College grounds. Three wells have been sunk to depths of 40 and 50 feet, and in one of them a boring to a depth of 176 feet tapped a stratum of gravel, which gives an abundant supply of water. The expenditure during the year under report was Rs. 10,007-9 as against Rs. 16,098 in the previous year. The receipts for the year amounted to Rs. 4,365-2-8.

APPENDIX II.

Agricultural Shows and Fairs.

Chinsura Agricultural and Industrial Exhibition.—This, the third exhibition, was held from Saturday, the 27th February, to Tuesday, the 9th March 1909. The Agricultural Department exhibited several varieties of paddy, seeds, pulses, cotton, etc. Mr. Smith, Deputy Director of Agriculture, Bengal, held a magic lantern exhibition, showing graphically the work of the Department to the villagers. Babu Nibaran Chandra Chowdhury, Travelling Inspector, delivered several lectures on agricultural subjects. The Director and Mr. Woodhouse, Economic Botanist to the Government of Bengal, was present on the opening day of the exhibition. The exhibition remained open for 11 days and was free to the public. Varieties of paddy, pulses, potato, cotton, jute, fruits and vegetables were exhibited by local cultivators. The Industrial section contained cotton and silk goods, painting, machinery implements, etc., etc. The Commissioner of Fisheries, Mr. Ahmad, exhibited some sea fish. The number of visitors was about 100,000. The Department assisted the Committee with a grant of Rs. 300.

Jessore Agricultural and Industrial Exhibition.—This exhibition was held in February 1909. The agricultural exhibits consisted of various kinds of potatoes, sugarcane, varieties of cotton and paddy, pulses, English vegetables and fruits. The Agricultural Department exhibited agricultural implements, machines, seeds and manures. Mr. Edmond, Travelling Inspector, demonstrated the use of implements and machines, and explained to the cultivators methods of properly tilling and manuring lands. The Behia mill and the sugar turbine exhibited, excited considerable interest. The visitors were much impressed with the experiment in *gur* and sugar-making. Mr. Smith, Deputy Director of Agriculture, Bengal, gave the cultivators magic lantern exhibition. The Department contributed Rs. 250 to the funds.

Purulia Agricultural and Cattle Show.—This show was held from the 8th to the 11th of February 1909. The Principal of the Agricultural College and one demonstrator from the Agricultural Department, as well as the Divisional Agricultural Inspector, attended.

Some ploughs and a sugarcane machine were exhibited by the Department, and the process of making *gur* demonstrated. The exhibits consisted of grains, pulses, cattle and poultry, food articles, garden produce, agricultural implements and works of local arts and industries. The Department contributed Rs. 300 to the funds.

Bankura Agricultural and Industrial Exhibition.—The third exhibition was held from February 1st, 1909, till February 10th. His Honour the Lieutenant-Governor of Bengal distributed the prizes to the successful competitors. The number of exhibits in the Agricultural section was 1,220 and in the Industrial 1,953. A large number of agricultural implements were exhibited by Messrs. T. E. Thomson & Co. and Messrs Jessop & Co. of Calcutta. Implements were exhibited by the Agricultural Department. A Travelling Inspector of the Department demonstrated the process of preparing *gur* from *khari* sugarcane in the presence of a large number of cultivators. *Buri* cotton, silk cotton, *akanda*, ladies-finger fibre and sunhemp were exhibited. Mr. Smith gave a magic lantern exhibition. The Inspector of the Burdwan Division deputed by the Burdwan Commissioner delivered an open air lecture on the improvement of agriculture in the Bankura district. In the Industrial section the exhibits were of different varieties and on the whole good. The Department contributed Rs. 500 to the funds.

Angul Exhibition.—The sixth annual exhibition was held from the 14th to 16th February 1909. The Chiefs of the Orissa Tributary States co-operated with the Committee and sent exhibits. The Inspector of the Orissa Division and the Superintendent of the Cuttack Farm were present. The exhibits were poor compared with preceding year. Silver medals were awarded to the two most successful cultivators. Cattle were few in number and poor in quality. Mr. M. S. Das, C.I.E., of Cuttack gave three silver medals.

Chaibassa Mêla.—The exhibition was held from the 4th to the 5th January 1909. In the Agricultural section rice, sugarcane and vegetables and cattle were exhibited. Among the industrial exhibits were carpentry, weaving and pottery. The Department contributed Rs. 222-8.

Sitamarhi Cattle Show.—The *mêla* is held during the *Ramnavami* fair, and this year extended from 30th March 1909 to 8th April 1909. There were 30,000 cattle at the *mêla*, but only 230 were exhibited. The Agricultural and Industrial show was held in April 1st. Rupees 238 were awarded in prizes to cattle. Implements, seeds, etc., were exhibited by the Department. The Deputy Director of Agriculture visited the show. The Department contributed Rs. 200 to the funds.

Singheswar Agricultural and Industrial Exhibition.—This exhibition was held from the 20th to 22nd February 1909. Two additional sheds were erected for the exhibits from the Agricultural Department. The total number of exhibits of all classes was 1,479, against 510 in the previous year. Varieties of paddy, gram, potato and sugarcane were exhibited. The total amount paid in prizes was Rs. 824-2, against Rs. 688 of the previous year. It is reported that, as a result of the last year's demonstration, many Meston ploughs are now in use in the subdivision. Babu Nibaran Chandra Chowdhury, Travelling Inspector of the Agricultural Department, held a practical demonstration of improved implements and explained to the cultivators their advantages. The cattle show was fairly good. The Veterinary Assistant of the subdivision helped the Judging Committee. Babu Saroda Prosad Sirkar, Subdivisional Officer of Madhipura, and Babu Narain Prosad were specially commended for their work in connection with the exhibition. The Department contributed Rs. 150 in aid of the funds of the exhibition.

Baraset Agricultural and Industrial Exhibition.—This exhibition was held during the *Sripanchami* holiday from the 26th to 28th January, and a great advance on previous exhibitions was noticeable. A Travelling Inspector of the Department was deputed to exhibit sugar-manufacturing pans and other implements and samples of paddy and seeds. Mr. Smith was present. Prizes to the value of Rs. 127-8 were given to the competitors. The Department contributed Rs. 200 towards the funds.

Basirhat Industrial and Agricultural Exhibition.—The second annual exhibition was held on the 25th January 1909. The local agricultural exhibits were poor. A Travelling Inspector of the Agricultural Department was deputed to demonstrate the use of improved implements and to deliver lectures on agricultural subjects. The number of industrial exhibits this year was greater than in the previous year. The Department contributed Rs. 200 to the funds.

Kurseong Horse and Flower Show.—The show was held as usual on Easter Monday and was well attended. The horses were better in quality than in previous years. The poultry exhibits were on the whole satisfactory. The show of flowers and vegetables was good. As the agricultural portion of this show is unimportant, the Department did not contribute to the funds.

Kalimpong Mêla.—This *mêla* was held on the 25th and 26th November 1908. The exhibits of grains and cattle were good. Ponies were poor. There was a big turn out of mules and 300 were purchased by the Transport Officers. The number of entries in all sections was 1,230, and prizes to the value of Rs. 1,359-8 were distributed to the successful exhibitors. The Department contributed Rs. 850.

Bagdogra Mêla (Darjeeling Terai).—This *mêla* was held from 3rd to 17th February 1909, both days inclusive. There were 1,536 animals, against 1,017 of the preceding year and the quality of the cattle was better than in previous years. Prizes to the value of Rs. 226 were awarded (Rs. 97 for cattle and Rs. 129 for agricultural and industrial exhibits).

Suri Cattle and Produce Show.—The 13th annual show was held from 14th to 17th February. His Honour the Lieutenant-Governor of Bengal distributed the prizes. A Travelling Inspector was deputed and the Divisional Inspector was also present. Both assisted the Judging Committee and explained the use and advantages of the improved agricultural implements, seeds and manures exhibited by the Department. The Travelling Inspector demonstrated the manufacture of *gur* from sugarcane and a scientific process of cleaning. The exhibits in the Agricultural section were 1,035 and in the Industrial section 560, against 803 and 515 of the preceding year. Cotton, jute, Central Provinces *aus* paddy and *Samudrabali* paddy, cassava, potatoes, tobacco and English vegetables, such as cabbages, cauliflower, knolkhol, carrots, turnips, beat and tomatoes, were exhibited by local cultivators, members of the Association and other gentlemen of the district. The cattle show was better attended than last year. A sum of Rs. 300 was contributed by the Department.

Banjetia Industrial and Agricultural Exhibition.—This exhibition was opened on the 9th March 1909 by the Hon'ble Mr. F. A. Slacke, C.S.I., accompanied by the Director, and closed on 14th March. Mr. Smith gave a lantern demonstration and a Travelling Inspector delivered lectures on agricultural subjects. There was decided improvement in the agricultural exhibits. In the Cattle section were imported and locally-bred bulls as well as lambs, rams, goats, fowls, etc. The Industrial section of the exhibition was good. The Department contributed Rs. 250.

Khulna Exhibition.—The exhibition was held from the 8th to the 18th of February 1909. In the Agricultural section various kinds of paddy, jute, cotton, potatoes, sugarcane, vegetables, fruits and dairy produce were exhibited. Mr. Smith, Mr. E. J. Woodhouse, Mr. N. N. Banerjei and Babu Nibaran Chandra Chowdhury, Travelling Inspector, visited the exhibition. Mr. Smith gave lantern demonstrations, which were attended by a large number of cultivators. Mr. N N. Banerjei delivered a lecture on agriculture, and Babu Nibaran Chandra Chowdhury delivered a lecture in Bengali and demonstrated the use of agricultural implements. The Travelling Inspector also demonstrated *gur* manufacture. The Department contributed Rs. 500 to the funds.

Ranchi Agricultural and Industrial Exhibition and Cattle Show.—The second annual exhibition was held on the 11th and 12th March 1909. There were 1,100 exhibits, including tea, lac, cotton and *tasar* cocoons and coarse cloth and blankets by the local weavers. The value of prizes awarded was Rs. 149 for live-stock, Rs. 135 for agricultural produce and Rs. 90 for industrial exhibits—in all Rs. 374. The exhibition was very largely attended. An Inspector of the Civil Veterinary Department was present and helped the Judging Committee. Mr. Smith gave a lantern demonstration to the public, which was appreciated. The Department contributed Rs. 400 in aid of the funds.

Sambalpur Agricultural Show.—The fourth annual show was held during the *Moharrum* festival from 29th January to 2nd February. In all sections—Agriculture, Cattle and Industry—there was evidence of progress. Jute and *khari* sugarcane grown in the district were exhibited for the first time and created much interest among the people. Groundnut locally cultivated was good in quality. Improved methods of *gur*-making were demonstrated with a Behia mill and iron evaporating pans by a Travelling Inspector of the Department. The cattle show had 83 entries. Mr. Hoogwerf, the Principal of the Government Weaving School, exhibited four improved pattern fly-shuttle looms. Mr. Smith gave a magic lantern demonstration and lecture. Prizes to the value of Rs. 977, besides two silver medals, were awarded to the successful competitors. The Department contributed Rs. 300.

Barakapur Agricultural and Cattle Show.—This show was held on the 18th and 19th February 1909. A Travelling Inspector with agricultural exhibits and implements delivered lectures, gave demonstrations and distributed pamphlets on Agricultural subjects. The Superintendent of the Dumraon Agricultural Station attended the show with exhibits from the farm and demonstrated the process of *gur*-making. Mr. N. N. Banerjei helped in the judging of cattle. The Department contributed Rs. 150 to the funds.

Kendrapara Industrial and Agricultural Exhibition.—An Industrial and Agricultural Exhibition was held at Kendrapara during the first fortnight of February last. One important feature of the exhibition was the nature and the number of demonstrations for promoting the manufacture of *gur* and for proving the relative excellence of the different ploughs in use in India. The working of the Meston plough attracted much attention. Mr. Smith, who visited the exhibition on the 7th and 8th, gave a lantern demonstration on the cultivation of crops, which excited much interest. There were excellent collections of paddy, *mung*, mustard, *kulthi*, jute, barley and wheat. The Industrial section was also successful. A sum of Rs. 300 was contributed by the Department in aid of the funds.

Bihta Agricultural and Industrial Show.—This show was held from 18th to 21st of February in connection with the *Sivaratri mêla*. The number of agricultural exhibits was larger than in previous years. The chief feature was the practical demonstration of the working of balance wheel, corn-shellers, simplex chaff-cutters, winnowing machines, Bihea and Banerjei's cane-crushing mills, as well as the demonstration of *gur*-making. The working of the well-boring machines was also exhibited. Mr. S. Taylor with a travelling Inspector and the Superintendent of the Bankipur Agricultural station attended this show. The Department contributed Rs. 150 to the funds.

Bankipur Exhibition.—The exhibition was opened on the 14th January 1909 by the Lieutenant-Governor. This year a cattle and poultry show were added. The agricultural produce exhibited was not very satisfactory owing to the drought in Bihar. Prizes to the

value of Rs. 257 were awarded to the exhibitors in the Agricultural section of the exhibition. Babus Hari Prosad Singh and Lachman Singh were the recipients of the Oldham and Earle medals respectively. The cultivators were shown the actual working of the agricultural implements exhibited by the Department. Babu Haridas Banerjee, who was sent to Bareilly to learn the Hadi sugar-refining process, gave a demonstration to the cultivators with the help of a centrifugal belonging to Mr. Mylne of Bihea. Babu Upendra Nath Sen, Superintendent, Well-boring, demonstrated and explained the well-boring operation to the cultivators and landlords who showed considerable interest. The cattle show was satisfactory, considering this is the first attempt. Mr. Quinlan, Superintendent of the Civil Veterinary Department, exhibited cattle from the Pusa and Sripur herds. The poultry show was a failure, but will be tried again. The Industrial section was good. The Department contributed Rs. 500 to the funds.

Muzaffarpur Agri-Horticultural Exhibition.—The first annual exhibition was held on the 5th and 6th February 1909 under the auspices of the Muzaffarpur District Agricultural Association. Flowers, vegetables, food-grains and miscellaneous crops grown in Bihar, poultry, cattle, indigo, sugar and flax were exhibited. The Pusa Research Institute, exhibited produce of the farm, produce of botanical area, produce of kitchen garden, fibres, pests peculiar to Bihar cattle, poultry and some implements and silk culture and flax scutching were demonstrated. The working of ploughs, chaff-cutters, winnowing machines, cane-crushing mills and the manufacture of *gur* were demonstrated by the Department. A sum of Rs. 458 was given away in prizes. The Department contributed Rs. 500 to the funds.

APPENDIX III.

MEMORANDUM OF INSECT-PESTS REPORTED FROM BENGAL DURING THE AGRICULTURAL YEAR 1908-09, KINDLY SUPPLIED BY THE IMPERIAL ENTOMOLOGIST.

1. Letter, dated 22nd June 1908, from the Economic Botanist to the Government of Bengal, sending an insect (for identification) which he said was doing damage in indigo-fields. The insect was identified as *Schizodactylus monstruosus*, Dr.

2. Letters from the marginally-noted localities reporting an insect-pest of paddy, were received during August 1908. The pest was a Fulgorid bug, *Liburnia* sp. ?, probably new as a pest. The Entomological Assistant investigated, and the pest is being investigated at Pusa.

1. Rai Jauna, district Hooghly. (Report received direct.)
2. 24-Parganas. (Report received direct.)
3. Calcutta (damaged area, Hât Gobindpur, district Burdwan)—through Director of Agriculture, Bengal.
4. Muzaffarpur, Hooghly district (through the Director of Agriculture, Bengal).
5. Calcutta (damaged area, Hât Govindpur, district Burdwan)—through the Director of Agriculture, Bengal.
6. Satithan, Divarbasini Post Office (through the Director of Agriculture, Bengal).
7. Burdwan (through the Director of Agriculture, Bengal).
8. Calcutta (through Reporter on Economic Products to the Government of India).
9. Kandi, district Murshidabad (through the Economic Botanist, Bhagalpur).
10. Jara (through the Economic Botanist, Bhagalpur).

3. Letter, dated 24th August, from the Officiating Director of Agriculture, Bengal, forwarding specimens of insects attacking *buri* cotton. The insects were found to be the Cotton Leaf Rollers (*Sylepta derogata*, F.).

4. Letter, dated the 7th August 1908, from Babu N. C. Chatterjee, sending specimens of ants which destroyed his brinjal seedlings. The ants were identified as *Solenopsis geminata*, F.

5. On 23rd September 1908, the Superintendent of Gardens, Darbhanga Raj, sent specimens of insects for identification, which he found feeding on Rose plants. Coccids (*Aspidiotus* sp. and *Monophlebus* sp.).

6. The Deputy Collector of Gaya reported on 13th November 1908 that an insect-pest (Sugarcane grasshoppers, *Chrotogonus*) was causing damage to barley, wheat and *masur* crops.

7. The Assistant Settlement Officer, Bihta, reported on 22nd November 1908 that a Green Fly was damaging *gora* paddy, which he reported from Ranchi. The pest was the common Rice Bug, *Leptocorisa varicornis*, Fabr.

8. Letter, dated 31st August 1908, from the Reporter on Economic Products to the Government of India, forwarding specimens of a beetle which damaged pice-boxes at the Mint. The beetle was found to be a Bostrichid, *Heterobostrychus* sp.

9. On 2nd December 1908, J. A. Hubbock, Esq., sent some grasshoppers (*Chrotogonus*, *Epacromia*, *Tryxalis*) which, he said, were doing a lot of harm to the *rabi* crops in Monghyr and Patna districts.

10. Babu Janki Prasad of Gulzarbagh, Patna, reported that white-ants were damaging thatches, and requested to be informed of some remedial measures which were suggested.

11. Letter, dated 19th April 1909, from the Divisional Agricultural Inspector, Patna Division, sending some diseased potatoes, which were found to be attacked by the potato moth (*Phthorimea operculella*, Zell.).

12. Letter, dated 3rd June 1909, from the Deputy Commissioner of Sambalpur, sending specimens of insects which attacked sugarcane. The insect was identified as *Chilo simplex*, Butl.

13. Babu Gouri Prasad Sukul of Harish Chandrapur, Malda, reported that the young shoots of his mango grafts were destroyed at night by an insect, probably *Brachytrypes achatinus*, St.

14. Letter, dated 15th June 1909, from the Subdivisional Officer, Magura, reporting an insect-pest of paddy. The pest is a caterpillar of a Noctuid moth, unidentifiable at present and new as a pest; the Entomological Assistant is investigating.

APPENDIX IV.

An Account of the Scientific work on Indigo during the year 1908-09.

The annual report of the Sirsiah Research Station, dealing with the work done on indigo up to January 1909, was published by the Bihar Planters' Association.

Very little has been done since then owing to the uncertainty of the maintenance of the station, which rendered the starting of fresh agricultural experiments of doubtful utility, and led to my reverting to the post I then held at Pusa for a period of three months. For the first of these reasons this uncertainty has affected all that has been done during the past year. The future of experimental work on indigo lies almost entirely in agricultural directions, in attempts to improve the indigo plant by selection and breeding, to stimulate the production of indigo in it by manurial treatment, or to discover new plants capable of yielding more indigo than anything we yet have. All such experiments take several years to bring to a conclusion, and need constant collaboration between a chemist and a botanist, so that, until it was certain that the work would be continued for a period of years and that it would be possible to engage a botanist for that period, a serious start could not be made.

The annual report referred to above contains an account of such work as had been done between January 1908 and January 1909 in these directions and on some other questions connected with the agriculture, manufacture and application of indigo. The original report should be consulted for a full record of the work.

Dye-Tests.

In the first place an account is given of an extensive series of dye-tests which were carried out on a fairly large scale with a view to determining the relative dyeing-power of equal quantities of indigotin in the natural and synthetic forms under equal conditions. The conclusions arrived at are summarised as follows:—

"The question which is the better dye cannot, therefore, be finally answered by our experiments. Judging by a mere comparison of the shades obtained from our dyeings conducted under certain conditions, the results are the same so long, at any rate, as the vats are fairly concentrated; but it is still an open question whether one does not "go further" (from the dyer's point of view) than the other. In our experiments only about 10 per cent. of the total indigotin present was removed from the vats in each case, and it is quite possible that any residual advantage which might exist in either case did not come perceptibly into play. Moreover, we have frequently observed that the synthetic dye shows more tendency to wash off the wool after dyeing than the natural, that is to say, the latter seems to be fixed more firmly on the fibre. In comparatively small tests, like ours, the influence of a factor of this sort, though seen, does not have any perceptible effect on the results, but on a large scale it may make all the difference in the value of the dyes, and it is possible that this alone explains the superiority of natural indigo which many dyers have observed. It does not, in fact, seem improbable that this is so, since it may well be that the bodies other than indigotin in solution in the natural vat lead to the deposition of the indigotin in a physical form which is more easily held by the fibre, and that glue, which the synthetic makers recommend for use with their preparation (and which we used throughout our experiments), does not have the same effect.

I do not make these comments from a desire to shirk a complete admission of equality, but because I have so frequently received assurances from practical dyers that the natural dye does, indeed, "go further" in their vats, and it may be that an explanation lies in the points we have not been able to investigate. The experiences of practical dyers to which I refer are not obtained with vats made up in special and peculiar ways; these can, no doubt, be prepared so as to show superior results, for the first few dips at any rate with either dye. For instance, as I have shown above, a superior result can always be obtained with natural indigo by adding to each vat an equal quantity of hydrosulphite, sufficient to completely reduce the indigotin in both cases, or, as the Cawnpore test showed, by having a larger excess of alkali in the synthetic vat; and, conversely, by adding only just enough hydrosulphite to reduce the indigotin in the synthetic form, superior results could be obtained with it, owing to the incomplete reduction of the indigotin in the natural indigo. But the

comparative trials made by practical men are independent of all those, and other variables. They are generally made with chemical vats, and extend over many weeks or even months. The results are usually expressed in money values by those who carry them out, since their object is to satisfy themselves on a matter of considerable financial importance to them; they can, however, easily be translated from this into relative values per unit of indigotin. Only recently I have heard of a comparative trial extending over six months and involving the dyeing of some thousands of pounds of materials with each dye, which showed a very considerable superiority for natural indigo when the results were expressed on the unit value of indigotin.

Trials of this kind seem to afford the only way by which the point can be settled. If the scale is large enough, the errors to which I have referred above assume a sufficiently small relative magnitude to be negligible; and the continuous working of the vats for some months gives full opportunity for utilising any residual advantage which may exist in the case of either dye, and eliminates any possible inequalities due to the vats being made up differently.

I think it would be well worth an effort on the part of the natural indigo industry to have such large-scale trials carried out under reliable supervision at some of the larger wool and cotton mills in India.

Manufacture.

In connection with manufacture an account is given of a series of experiments designed to determine the best rate of loading for the Java plant.

The experiments fully confirmed the indications recorded in previous years of the benefit to be derived from light loading with Java plant of good quality. Vats were loaded each day at the rates of 80, 100, and 120 maunds per 1,000 cubic feet respectively; manufacture was carried out in the way I have recommended (*i.e.*, steeping at an average temperature of 90° F. for 12½ to 13 hours, according to the quality of the plant, and oxidising by Rawson's ammonia-gas process), and the efficiencies were determined in the manner described in previous reports. The plant dealt with can be divided into two classes—the one having an average leaf-content of 40 per cent. and an average indigotin-content of the leaf of ·8 per cent., and the other an average leaf-content of 35 per cent. and an indigotin-content of the leaf of ·7 per cent. It will be convenient to consider the results under these two headings. The following average percentage efficiencies were obtained with the two classes of plant:—

	Load per 1,000 cubic feet.		
	80 maunds.	100 maunds.	120 maunds.
Superior plant ...	89·2	80·2	75·3
Inferior „ ...	70·8	81·0	67·8

Thus the superior plant has given the most efficient process with the lightest load, whilst the inferior plant gives the best results with the 100-maund load. The advice given in last year's report thus receives confirmation. Good quality Java plant should, accordingly, never be loaded more heavily than 80 maunds per 1,000 cubic feet, and the load should be increased as the quality of the plant falls off. No opportunity occurred for experimenting with plant of *very* poor quality this year, and I cannot, therefore, give definite figures on the rate at which such plant should be loaded; but it is doubtful if 100 maunds per 1,000 cubic feet should ever be much exceeded with Java plant, and 120 maunds is certainly the maximum limit. The indigotin-content of the leaf of this plant rarely falls much below ·6 per cent. in practice; and if the leaf-content is very low, as is sometimes the case in a year like the past when manufacture has to be perforce delayed owing to lack of water, it is advisable to cut only the tops of the plant for manufacture. If this is done, the quality of the plant put into the vats need very seldom fall below that limit at which loading at 100 maunds per 1,000 cubic feet is to be recommended. A short series of experiments was also carried out on this question in its application to Sumatrana plant, but the amount of plant available for experiments was very small indeed owing to the drought. As is usually the case in these circumstances, it was of a very fine quality. The average leaf-content was 51 per cent., and the average indigotin-content of the leaf ·6 per cent. Steeping this plant at the rate of 80 maunds per 1,000 cubic feet for 11 hours at an average temperature of 90° F., an average efficiency of 93·6 per cent. was obtained. This is exceptionally high, and would probably have been reduced had more experiments been possible. It must not, however, be taken that as light loading, as 80 maunds per 1,000 cubic feet is to be generally recommended with Sumatrana plant. In years of

ordinary rainfall, when the plant makes rapid growth, 40 per cent. of leaf and ·5 per cent. of indigotin in the leaf is a high estimate of average quality, and in this case loading should not be lighter than 100 maunds per 1,000 cubic feet. On the other hand, I do not think 120 maunds per 1,000 cubic feet should be exceeded in any circumstances.

The experiments which have been conducted on the filtration of seet-water have not been a success. The filtering apparatus mentioned in last year's report was lengthened, and cloths of a looser texture were tried, but in no case could we obtain satisfactory filtration in a reasonable time. It seems to be absolutely necessary to use cloths of as close a weave as those originally supplied with the apparatus in order to get anything like complete filtration, and even then, this is only the case after the cloths have become coated with sludge. In these circumstances filtration is far too slow to be practicable. It is essential that filtration shall proceed rapidly not only in order that it may be possible to deal with the large volume of liquid produced daily in an ordinary factory, but also because if the filtration is slow putrefaction takes place.

Considering the results of these experiments in conjunction with those of Rawson with a filterpress worked by a steam-pump under pressure (Report : 2nd edition, p. 86), it would seem that the precipitate suspended in seet-water is of too slimy a nature for satisfactory filtration under any practical conditions, and that further experiments in this direction are not likely to be profitable.

In this case the lesson to be learnt is that every precaution should be taken in the method of oxidation to promote good settling of the *mal*, and so avoid losses in the seet-water as much as possible. Rawson has shown that the use of alkalis in oxidising promotes this settling, and his ammonia process affords an extremely convenient method of applying an alkali. The difficulty of securing efficient filtraton of seet-water thus provides an additional argument for the general adoption of this method of oxidation which I have so often urged.

Failing ammonia, caustic soda may be used with advantage in oxidising with a similarly beneficial effect on the settling of the *mal* (Report : 2nd edition, p. 74).

The modifications of the powder-making machine, mentioned in last year's report, have led to more satisfactory results this year than we have previously obtained. A few pounds of powder were made, and more could easily have been prepared had the machine been working longer. The dried *mal* comes off the machine in the form of thin flakes which can readily be ground to a fine powder whilst still warm.

The machine is not yet by any means perfect : a wire brush would be much better than a bristle one, and the working of the machine is, at best, a good deal too slow for practical application on a wide scale. We have, however, heard of a machine which can be supplied ready-made by an Edinburgh firm which works on identically the same principle as that which we have employed, and should be at least equally efficient and very much faster in working. This machine is made for the preparation of dessicated milk and similar commodities. It has two drying cylinders on to which the liquid to be dried is fed from hoppers, and the spreading of the liquid on the cylinders is done mechanically. Judging by this year's experience of our experimental machine, I think there is little doubt that this will provide exactly what is required. A machine has been purchased from the makers, and is now installed and ready for working at Barah Factory in the Champaran district. It is hoped to give it a thorough trial on a manufacturing scale during "khoontie *mahai*" this year.

Agriculture.

The section of the report dealing with agriculture is almost entirely devoted to an account of some preliminary experiments in pot-culture on the application of metallic salts to the indigo plant with a view to stimulating the production of indican, and to a discussion of the results obtained and the general question of the physiology of the plant which these results open out.

Summarising the results obtained with the various metallic salts, the following figures are obtained :—

Treatment.	Total indigotin obtainable from the plant in two cuttings.
	Grains.
Copper sulphate	·794
Magnesium ,, ...	·432
Ferrous ,, ...	·348
Nickel ,, ...	·233
Blank	·262

These results are in many ways remarkable. In the first place, it is significant that the copper salt, which had the most marked effect, was the most violent poison employed. The fact that the indican-content of the plant so treated was so much greater in proportion to the other plants at the first cutting than at the second looks as if it were directly connected with the action of the copper, which may be expected to have had a greater action during the period of growth immediately succeeding its application. It may also have induced

the vigour of growth which characterised the plant throughout. In the second place, it is remarkable to find any benefit arising from the application of magnesium sulphate, since this salt is by no means a violent poison and is a very common constituent of many Bihar soils. But it must be noted that these plants were not grown in ordinary field soil, but in specially-prepared potting soil. This probably accounts for the generally low colour-content of the plants. Recollecting that the average colour content of the leaf of the plant grown in the ordinary way is ·7–·8 per cent., it will be seen that the figures obtained in these experiments were abnormally low—in fact the highest obtained, that for the leaf of the copper-treated plant at its first cutting, did not reach the average of the ordinary Java plant we were cutting at the time. I have frequently pointed out that plant-growing on rich soil is characterised by the low indican-content of its leaf, and these experiments seem to afford further confirmation of the point. The intention in using this rich soil was in order to try to determine if the vigour of growth characteristic of indigo in rich soil could be maintained without the corresponding decrease in the colour-content of the leaf which accompanies it. This can hardly be said to have been realised in any case, though the copper salt showed the desired tendency. It seems, as far as it goes, as if copper leads to vigour of growth and an early development of a high indican-content (*i.e.*, what is commonly called "early ripening"), whilst magnesium leads to good leaf development and a moderately high and steady indican-content of the leaf.

An experiment was started in November with copper sulphate on field soil on a plot divided into halves, one of which was irrigated with water containing this salt in solution and the other with the same amount of plain water. The copper salt seemed to have a considerable adverse effect on germination; so that, if any utility is to attach to it, it must be applied after the plant is fairly established, as was the case in the pot experiments referred to above. A few plants were, however, secured on the copper-heated plot, and they, together with the check plants on the adjoining plot, are now ready for analysis. This will be carried out within the next few days and the results reported in due course.

At present the whole question of the effect of stimulants on the production of indican, or, indeed, of the effect of any changes in the conditions of environment, is in a very rudimentary stage, and the results so far obtained can only be looked upon as the barest indications of possibilities. The fact is we know absolutely nothing about the biological aspect of the production of indican, and until we do so, we cannot hope to understand the effect of changes in the surrounding conditions. A close study of this question will form an important part of the future work on indigo. A pot-culture house is now being built at Sirsiah, and an extensive series of experiments designed to trace the effect of changes of conditions on indican production and, if possible, to explain its formation, will be carried on in it from year to year.

Another aspect of the biological problem is that of heredity. Little though we know of the conditions of environment which determine the production of indican, we know still less of the factors which influence the inheritance of the indican-producing faculty from parent plant to progeny. Extremely little is known of the laws which govern the inheritance of what may be termed chemical properties (in contradistinction to physical ones, such as the colour of flowers or length of stems) in any plants. The practical importance attaching to the problem has led to a certain amount of knowledge in the case referred to in my last report, that of the sugar-beet, and a few others of a similar sort might perhaps be quoted. But in all these cases, so far as I am aware, the simple principle of deriving seed systematically from high-yielding parent plants is all that has been done, and no attempt has been made to apply the more modern knowledge of the laws of heredity to them. In the case of the indigo plant we are concerned with a different type of chemical compound to any of those which have been dealt with even in this way; nothing has been done, even in the way of simple selection, in the case of a plant which is cultivated solely for the production of a glucoside and we do not even know if a faculty for the production of indican in large quantity is an inheritable characteristic at all. It may be that it is solely dependent on such conditions of environment as have been dealt with in the last paragraph, but the existence of species of *Indigofera*, which have as constantly different indican-producing power under normal conditions as *Indigofera arrecta* and *Sumatrana*, seems opposed to this. Still less has anything been attempted in the way of tracing the results of scientifically-controlled breeding in such a case as that with which we have to deal in the indigo-plant.

The field here is an enormous one, calling for years of patient work from both a chemist and a biologist schooled in the most recent views on heredity, and I am convinced that it is only by such careful study of the production of indigo in its biological aspects that any further material advance is to be made by scientific aid.

An effort is now being made to secure the services of a first-class botanist to collaborate in this work during the next five years, and it is hoped that he may be obtained and a start made in selection on botanical lines during this year.

A beginning has already been made in selection on purely chemical lines. In my last report I mentioned that seed had been kept from a number of Java indigo-plants which were selected in the field as being exceptionally high indigo yielders. The seed of each of these plants was sown on a separate plot in November last. The sowing was delayed until this month in anticipation of some decision being arrived at as to the continuation of the work here or elsewhere. Owing to the lateness of the season and the extremely short moisture, it was necessary to irrigate an area of land for the purpose. The plants suffered a good deal from cold and from insect attacks in their early stages, but in most cases sufficient

growth was obtained to throw some light on the question of the inheritance of the high indican-yielding faculty and of various morphological characteristics. The plants have only just been examined and analysed, and it is too early to draw any conclusion from the results, but they certainly seem to indicate that it may be possible to produce a plant of exceptionally high indigo-yielding power by selection on these lines. This work will be systematically carried out year by year. The plots should also serve as a nucleus for selection based on morphological characters.

No further progress has been made in the selection of Sumatrana indigo except that the stock of seed of the various sub-varieties has been increased. These were all sown on irrigation in April, and samples of the various types of plant analysed in September. The results of the analyses are hardly worth recording. They do not confirm those recorded in my 1906-07 report, but put the plants in an entirely different order of value. This may be partly due to the later season at which the analyses were carried out, but it is probably also partly due to cross-breeding amongst the plants. They have now been grown side by side for several seasons without any special precautions being taken to prevent cross-fertilisation. If this has taken place, the identity of the various types will probably be destroyed, and they will have to be collected afresh if further work is to be done on these lines. This is, however, another point on which the collaboration of a botanist is essential. A quantity of seed was collected from each sub-variety in November and has been stored for future use.

A new preparation for the inoculation of leguminous plants has been brought out during the past year by Prof. Bottomley, of King's College, London, under the name "Nitro-Bacterine." Prof. Bottomley has prepared a special culture for indigo, which is being tried at Sirsiah and by several planters. The principle on which it depends is precisely the same as that underlying the United States preparation referred to in my 1906-07 report, but Prof. Bottomley is said to have devised a new method of cultivating and preserving the nodule organisms by which the cultures are rendered more efficacious.

The plots here have just been cut, and samples of the plant obtained are being analysed. The results will be recorded in due course. No reports have yet been sent in by planters.

Finally, a *resumé* of the year's returns from Java plant, obtained both at Sirsiah and by a number of planters, is given and discussed in the annual report, and the results of certain experiments in the cultivation of Java indigo seed are recorded.

C. Bergtheil,

Director, Sirsiah Research Station.

APPENDIX V.

A list of Agricultural Implements and Machines tested in Bengal during the year ending 30th June 1909, and of those in use which are reported to have met with success.

No.	Designation of Implement.	Use.	Special advantage.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by cultivators.
1	2	3	4	5	6	7	8	9
				Rs. A				
1	Steam Thresher...	Wheat and oats	Very efficient in threshing and cleaning.	3,200 0	Messrs. Bar Reid & Co., Aberdeen.	Mr. M. M. Mackenzie, Superintendent, Sripur Farm, Hathwa Raj.	Gets out of order frequently.	
2	Centrifugal Pump	Irrigation ...	Irrigates 10 acres of land.	.....	.....	Ditto ...	.....	
3	Donaldson's Oil Mill.	Crushing mustard	Gives 5 per cent. of more oil than the wooden *kolhu*.	120 0	Messrs. Jessop & Co., Calcutta.	Ditto ...	Too heavy for hand power.	
4	Maize Huller ...	.....	Useful where hand labour is not available.	75 0	Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	Recommended for small farms.	
5	Winnower (Cabbets' patent).	.....	Very useful machine in the absence of wind.	125 0	Ditto ...	Ditto ...	An efficient and strong machine. Can clean 200 maunds of grain in 8 hours.	
6	Chaff Cutter (Steam).	Fodder ...	Cuts fodder fine and of even length, economical.	300 0	Messrs. Jessop & Co., Calcutta.	Ditto ...	Most suitable machine for large agricultural and cattle farms.	None.
7	"Albion" Reaping Machine.	Oats, barley and wheat.	Cheap, and cuts rapidly.	450 0	Messrs. Marshall Sons & Co., Calcutta.	Ditto ...	Cuts 10 acres per day. Two pairs of bullocks and three men are required. Recommended for big farms.	
8	Eclair Vaporizer	Insecticides ...	Efficient	75 0	Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	Recommended for small farms.	
9	Corn Crusher ...	.....	Economical and labour saving.	126 0	Messrs. Jessop & Co., Calcutta.	Ditto ...	Useful and efficient machine.	
10	Gallicus	Pulverizing subsoil.	Breaks sub-soil where it is left untouched by plough.	10 0	Superintendent, Sripur Farm.	Ditto ...	Strong useful implements.	
11	Planet Junior Hand Hoe, single wheel.	.....	Very useful in making ridges.	15 8	Messrs. T. E. Thomson & Co.	Manager, Svedpur Trust Estate, Khulna, and Collector of Purnea.	Very useful implement.	
	Ditto, double wheel.			25 0				
12	Iron *Dôn*	Irrigation ...	.....	9 0	Burdwan ...	Collector of Bankura and Manager, Burdwan Raj.	Worked well ...	Used extensively by agriculturists.
13	Leather Bags and Wooden *Dôns*.	Ditto ...	.....	12 0	Shahabad ...	Manager, Dumraon Raj.	.....	Used throughout the Shahabad District.
14	Indian Plough ...	.....	.....	10 0	Ditto ...	Ditto ...	.....	
15	Howard Cotton D. Plough.	For cultivation to a depth of six inches.	Inverts soil and ploughs deep.	45 0	J. and F. Howard, Britannia Iron Works, Bedford, and Superintendent, Sripur Farm.	Superintendent of the Sripur Farm, Hathwa Raj.	An efficient strong implement, well suited for eradicating weeds.	.....
16	Meston Plough...	.....	Ploughs deep and uniform: very useful in sandy soil.	5 2	Agricultural Department, Bengal.	Subdivisional Officer, Madhipura.	Recommended ...	Three ploughs were introduced in March 1907. At present 26 ploughs are in use and demand continues to increase.

No.	Designation of implement.	Use.	Special advantage.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by cultivators.
1	2	3	4	5	6	7	8	9
				Rs. A.				
17	Sibpur Plough ...	Deep ploughing and breaking the soil.	Being made of wrought iron, can be easily repaired.	13 12	Agricultural Department, Bengal.	Deputy Commissioner, Angul.	Too heavy for the ordinary bullocks of the Angul District.	Used in the Demonstration Farm, Angul.
18	Hindustan Plough.	.....	Ploughs deep and inverts soil.	14 0 to 20 0	Messrs. T. E. Thomson & Co.	Secretary of the District Agricultural Association, Sambalpur.	Decidedly better than the country plough: can be managed by local bullocks of average strength.	.....
19	Three-roller Bohia Sugarcane Mill.	Crushing sugarcane.	Juice can be extracted in shorter time with less labour and expense.	75 0 to 140 0	Messrs. Thomson and Mylne, Bohia, Shahabad.	Deputy Commissioner of Angul and Superintendent of the Sripur Farm.	Very useful ...	Largely used by cultivators.
20	Bohia Sugarcane boiling Pans.	Manufacturing molasses.	Large quantity of juice can be boiled at one time and the froth easily removed.	15 0 to 20 0	Ditto ...	Deputy Commissioner of Angul.	Ditto ...	Ditto.
21	Banerjee's three-roller Sugarcane crushing Mill.	Ditto ...	Gives better outturn than the ordinary wooden mill.	63 0	Messrs. Ram Narain Banerjee & Sons.	Deputy Commissioner of Sambalpur.	Gave 12 per cent to 20 per cent better outturn than the wooden mills.	Newly introduced and not yet generally known.
22	Banerjee's Iron evaporating Pans.	Ditto ...	Economical and useful.	20 0	Ditto ...	Ditto ...	Cleaner and better crystallised *gur* than the earthen pots used at present. Fuel and labour are economised.	Ditto.

APPENDIX VI.

Expenditure on miscellaneous experiments and enquiries during the year ending the 30th June 1909 other than those carried out in agricultural stations.

	Rs.	A.	P.	Rs.	A.	P.
Central Seed Store				15,491	5	9
Supplies and Services—						
Seed	7,298	1	9			
Manures	847	7	0			
Implements	1,596	12	10			
Other charges	2,300	2	9			
Rent of Seed Store	2,200	0	0			
Establishment—Pay and travelling allowance	1,248	13	5			
Special crops	...			58,092	3	1
Improvement and extension of cotton cultivation	15	0	0			
Improvement of sericulture in Bengal ...	33,077	3	1			
Bihar Indigo-Planters' Association ...	48,200	0	0			
Tea Association	3,500	0	0			
Jute experts	3,300	0	0			
Agricultural Associations	...			17,539	1	2
Central Association	3,741	6	9			
Contribution to Divisional and District Agricultural Associations	5,000	0	0			
Establishment—Pay and travelling allowance of Divisional Agricultural Inspectors ...	8,797	10	5			
Distribution of Agricultural literature ...	...			1,688	13	9
Temporary establishment	250	0	0			
Printing at private presses	1,438	13	9			
Expert staff—Pay and travelling allowance of Travelling Inspectors and supernumerary Officer	3,038	14	5	3,038	14	5
Miscellaneous	...			20,912	2	10
Contribution to Agricultural and Cattle Fairs	6,525	8	0			
Temporary establishment—Pay and travelling allowance for Agricultural and Cattle Fairs	985	0	4			
Carriage of implements, etc., for Agricultural and Cattle Fairs	2,564	3	3			
Contribution to Deoghar School ...	560	0	0			
Deputation of students to foreign countries ...	10,236	5	3			
Ditto of officers to special duty ...	41	2	0			
	1,46,762	9	0	1,46,762	9	0

B. S. Press—2-11-1909—2480J—600—W. M. D'C. & others.

REVENUE DEPARTMENT.

AGRICULTURE.

CALCUTTA, THE 12TH DECEMBER 1909.

RESOLUTION—No. 3956 Agri.

READ—

The Report of the Department of Agriculture, Bengal, for the year ending the 30th June 1909.

Mr. W. R. Gourlay, I.C.S., was in charge of the Department throughout the year. The only change in the *personnel* of the expert officers stationed at Bhagalpur consisted in the transfer of the Principal, Mr. Corbin, to the Punjab, his place being taken by Mr. A. C. Dobbs.

2. *Organization.*—The question of the organization of the Provincial Agricultural Service is still under consideration. The present staff of Provincial Officers consists of 4 assistants who are being trained for employment as teachers at the Provincial Agricultural College, 2 travelling inspectors, 7 superintendents or overseers in charge of agricultural stations, 6 inspectors of agriculture, 1 assistant mycologist and 1 assistant entomologist. Three students returned from America in 1907-08 after receiving agricultural training at the Cornell University, and were appointed as assistants in the department; and of the two who returned during 1908-09 one entered the department as a probationer.

3. *Agricultural Stations.*—Six agricultural stations at Dumraon, Bankipore, Sabaur, Chinsura, Burdwan and Cuttack were at work during the year. Steps were taken to start two more stations at Kharagpur in Midnapore to represent the laterite area, and at Ranchi to represent the Chota Nagpur plateau; but the projects have been kept in abeyance for want of money. The experimental work at Fraserganj was stopped owing to the difficulty of supervision; and the two small jute seed farms maintained at Berhampore and Purnea were closed as the work can be done equally well at the Chinsura and Burdwan stations.

4. *Scientific Experiments.*—The experimental cultivation of various kinds of crops, including jute, cotton, flax, sugarcane, potato and rice was carried on at various places in the Province with diverse results. Experiments with jute conducted at the Burdwan station on the lines laid down by the Inspector-General of Agriculture were attended with successful results and proved conclusively that, with due care in cultivation and retting, the Burdwan cultivators could produce from the Narayanganj seed as good fibre as is to be found in Eastern Bengal. The cultivation in Bihar by indigo planters has been discontinued.

The experiments with cotton had unsatisfactory results. The flax cultivation at Dhooria in Muzaffarpur was financially very successful. The Agricultural Chemist conducted a series of experiments to test the sugar-yielding properties of the different varieties of sugarcane, but no definite conclusions have yet been reached.

5. *Sericulture.*—The work of the silk-rearing establishment made satisfactory progress during the year. The old silk committee, consisting of non-official members, was abolished and was replaced by a new one with four silk experts as members and the Director of Agriculture as president. Under the supervision of this new committee a mulberry farm with a central seed-rearing nursery was started at Berhampore. The 9 model nurseries belonging to the old silk committee have been brought under government management,

and 5 new ones are under construction, of which 3 are in Berhampore, 1 in Birbhum and 1 in Midnapore. They are intended to supply healthy seed to the rearers of silk-worms. The total value of the seed sold was Rs. 5,874. Experiments made with Japanese and Italian mulberry seed gave encouraging results.

6. *Agricultural Education.*—Little advance was made during the year in the promotion of agricultural education in the province. Unexpected delay in the commencement of the Agricultural College buildings at Sabaur will prevent the opening of the classes before November 1910. Meanwhile, the agricultural classes at the Sibpur Engineering College have been abolished, but an attempt to secure some continuity in training has been made by the grant of scholarships at institutions in other provinces. The students attending the agricultural classes attached to the several zilla schools and the collegiate school at Cuttack generally took little real interest in their work, the only exception being at Gaya, where agricultural instruction has been made a part of the general routine. The deputation of more students to America to study agriculture was discontinued during the year, partly because the supply of such trained men was likely to exceed the immediate requirements of the department and also because it seemed doubtful whether training under American conditions was altogether suitable for this country.

Mr. A. C. Sen, retired District and Sessions Judge, who was trained at the Cirencester College in England, has kept up his interest in agriculture, and has both held classes for cultivators and delivered popular lectures on the subject. Voluntary services to the cause of agriculture of this character are specially valuable, and deserve the fullest recognition from the community.

7. *Agricultural Associations, Fairs and Exhibitions.*—The great interest taken in the agricultural development of the province by many members of the Provincial, Divisional and District Agricultural Associations, and the services rendered by them to the Agricultural Department are a source of gratification to the Lieutenant-Governor, to whom the work of Mr. Sarada Charan Mitter, late a Judge of the Calcutta High Court, Rai Lalit Mohan Singh Ray Bahadur of Chakdighi, and Babu Purnendu Narayan Singh, Secretary, Patna Association, has been specially reported. Mr. A. N. Moberly, I.C.S., has done much in his capacity of Chairman of the Sambalpur District Association for the benefit of agriculture in that district.

The agricultural fairs and shows held during the year, of which a brief account is given in Appendix II to the report, received grants-in-aid from Government aggregating Rs. 6,522. They appear to be continuing to serve a very useful purpose.

8. *Irrigation.*—The well-boring operations which have been undertaken in this province on the recommendation of the Indian Irrigation Commission have made little progress during the year, partly in consequence of the want of practical experience on the part of the superintendent and partly because of the difficulty of close supervision over his work. He will for the future conduct his experiments under the supervision of the Principal of the Agricultural College at Sabaur. A large number of artesian wells were bored during the year in Muzaffarpur by the District Board in connection with the scarcity of water that prevailed there and were to a considerable extent successful.

9. *Publication of agricultural information.*—Besides the quarterly Journal of Agriculture which was started during the previous year, the department published and circulated leaflets and notes containing information in connection with agriculture. Large quantities of seeds of various crops, manures, and agricultural implements were issued from the government central seed store, which was removed during the year to the site of the Agricultural School Farm at Sibpur.

10. *Indigo Research.*—The indigo research operations at Sirsiah were continued with the aid of the Government subsidy of Rs. 50,000. For the next five years Government will contribute Rs. 32,500 a year on condition that the Bihar Planters' Association subscribe Rs. 10,000 annually to the cost of the research work. The Association have obtained for that period the services of Mr. C. J. Bergtheil, who has resigned his post as Imperial Bacteriologist in the Pusa Agricultural College and Research Institute in order to carry out and complete his researches.

11. *Conclusion.*—The thanks of the Lieutenant-Governor are due to Mr. W. R. Gourlay, I.C.S., Director of Agriculture, Bengal, for his administration of the department during the year. His Honour also notices with satisfaction the appreciation by the Director of Agriculture of the assistance rendered by the several officers mentioned in paragraph 67 of his report.

ORDER.—Ordered that the resolution be published in the *Calcutta Gazette*, and that a copy of it, with a copy of the report, be submitted to the Government of India.

By order of the Lieutenant-Governor of Bengal,

F. W. DUKE,

Chief Secy. to the Govt. of Bengal.

No. 4017 Agri.

COPY, with a copy of the report, forwarded to the Appointment Department of this Government for information.

No. 4018 Agri.

COPY, with a copy of the report, forwarded to the Director of Public Instruction, Bengal, for information, with reference to paragraph 6 of the resolution.

By order of the Lieutenant-Governor of Bengal,

B. A. COLLINS,

Under-Secy. to the Govt. of Bengal.

CALCUTTA,
The 12th December 1909.

B. S. Press—21-12-1909—4599C—800—T. N. R.

REPORT

OF THE

3 DEC. 1910

AGRICULTURAL DEPARTMENT, BENGAL,

FOR THE

Year ending 30th June 1910.

CALCUTTA:

BENGAL SECRETARIAT BOOK DEPÔT.

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DEPARTMENT OF AGRICULTURE, BENGAL.

No. 8744A.

FROM W. H. BUCHAN, ESQ., I.C.S.,
Offg. Director of Agriculture, Bengal,

TO THE SECRETARY TO THE BOARD OF REVENUE, L. P.,
LAND REVENUE DEPARTMENT.

Dated Calcutta, the 14th September 1910.

SIR,

I HAVE the honour to submit the Fifth Annual Report of the Agricultural Department, Bengal, for the year ending 30th June 1910.

I have the honour to be,

SIR,

Your most obedient servant,

W. H. BUCHAN,
Offg. Director of Agriculture, Bengal.

REPORT

OF THE

AGRICULTURAL DEPARTMENT, BENGAL.

(For the year ending 30th June 1910.)

CHAPTER I.

ADMINISTRATION.

Charge.—The Hon'ble Mr. W. R. Gourlay, I.C.S., now officiating as Secretary to Government, held the post of Director up to the 10th of February 1910. I was in charge of the Department during the remainder of the year under report. Mr. Smith, the Deputy Director, was, as before, in charge of all the agricultural stations except that at Sabour, which is supervised by Mr. Dobbs. Mr. Dobbs was Principal of the Agricultural College, and also supervised the well-boring operations. Mr. Taylor, the Agricultural Chemist, and Mr. Woodhouse, the Economic Botanist, transferred their quarters and laboratories to Sabour during the year. Mr. N. N. Banerjei worked as Personal Assistant to the Director of Agriculture up to the 2nd January 1910, when Babu N. N. Sircar succeeded him.

2. *Staff.*—Proposals for the reorganisation of the departmental staff, revised in accordance with the suggestions of the Government of India, have been submitted for sanction, and the scheme is under the consideration of Government. To the college staff one addition has been made by the appointment; as Assistant Professor of Mycology, of Mr. S. K. Basu, who was for five years First Assistant to the Imperial Mycologist at Pusa. The Assistant Professor of Entomology, Mr. H. L. Dutt, a graduate of Cornell University, has returned to Sabour after completing his training under the Imperial Entomologist. The Assistant Mycologist and the Assistant Entomologist, who also were under training at Pusa, returned to Sabour during the latter part of t he year. The College staff will be complete with the addition of an Assistant Professor of Chemistry, Physics and Mathematics and of a Demonstrator in these subjects.

Two students, the last of those sent by this Government for training to Cornell University, returned in December 1909. One of them, Mr. B. M. Chatterjee, was posted to Sabour as Superintendent of the Agricultural Station attached to the College on the resignation of Babu Hari Prosad Mitra. The other student was not offered an appointment in this Department. What might be called the field staff of the Department now consists of one Travelling Inspector, Babu N. C. Choudhury, six Agricultural Inspectors, one attached to each Divisional Association, and five Superintendents of Departmental Farms. Syed Nasiruddin Ahmed, a former Overseer of the Muzaffarpur Municipality, was appointed to act on probation as Superintendent of Well-boring in place of Babu Upendra Nath Sen, who reverted to the the Public Works Department. He worked under the direct supervision of Mr. Dobbs.

3. *College.*—The main buildings of the Provincial Agricultural College at Sabour have been completed, and some minor additions and alterations to the quarters of the staff are now being made. The work of fitting up the laboratories and furnishing the College is being carried on under the supervision of the different officers concerned. In addition, Mr. Woodhouse has been occupied in laying out the Botanical Garden and the College grounds. The College will be opened for students in November next, by which time it is expected that all preliminary arrangements will be complete.

4. *Agricultural stations.*—No new agricultural station was opened during the year, nor is it intended to extend in this direction until the existing farms

are properly established and a supply of men fit to take charge of farms is available. The question of continuing the existence of the Chaibasa Farm is under consideration. The laying out of the Sabour and Chinsura Agricultural Stations is still in progress, and they are not yet in full working order. The area added to the Cuttack Agricultural Station is being laid out gradually. A proposal to open a demonstration farm at Sambalpur is receiving attention.

5. *Sericulture.*—Babu Apurva Coomar Ghose continued to hold charge of the sericultural work, which is being developed steadily. Several new nurseries were established, and a scheme for the training of rearers' sons was initiated.

6. *Fisheries.*—An important development was the incorporation with this Department of the work in connection with Fisheries on the completion of Mr. A. Ahmad's term of appointment as Commissioner of Fisheries. The staff consists of two Assistants—Mr. B. Das and Mr. M. Moshin—who have undergone a year's training in Europe and America respectively.

7. *Tours.*—Mr. Gourlay was on tour for 113 days, which includes 43 days spent by him in making a special enquiry into the indebtedness of tea-garden coolies in the Darjeeling district. I spent 40 days on tour. The Deputy Director inspected all the agricultural stations very frequently. Messrs. Dobbs, Taylor and Woodhouse each spent a number of days on tour.

8. *Miscellaneous.*—The report on the experimental wage census of Bengal, taken in August 1908, was submitted in April last; arrangements are being made to take the first regular wage census in 1911.

9. The usual crop forecasts, agricultural statistics, reports and statistics on weather and crops, prices and rainfall were prepared and published. The annual table of the average wholesale prices has been discontinued under Government orders.

10. The Quarterly Journal of Agriculture was published during the year, and the number of subscribers rose from 250 to 275. Copies of the journal are distributed free to Agricultural Associations and others. On matters of special interest to cultivators separate leaflets were published in English as well as in the different vernaculars of the province and widely distributed through the agency of District and Divisional Associations.

11. Mr. Smith, Deputy Director, Mr. A. C. Dobbs, Principal of the Agricultural College, and myself attended, as members, the sixth meeting of the Board of Agriculture, which was held at Pusa during February 1910. Messrs. Woodhouse and Taylor also attended the meeting as visitors.

CHAPTER II.

Research—Special Enquiry and Experiments.

12. *Agricultural Chemist.*—A considerable part of Mr. Taylor's time was occupied in the supervision of the organisation and fitting of various laboratories. In addition to the chemical analyses of samples of soils, manures, food-stuffs, etc., which numbered 915, Mr. Taylor continued his scientific work on the lines laid down in his programme for 1909-10. This chiefly concerned sugarcane. He completed a series of experiments on the periods of maturity of certain Bengal canes, which were collected and planted by him in 1909, and he continued his experiments on chemical selection. The experiments with reference to the period of maturity of the various types have brought forth many points of difference which are of great interest. The observations made this year have furnished much information as to the sugar-yielding power of the different varieties under the conditions of the last season. A separate report on the subject is in the Press, and will shortly be published as a departmental record. In this connection it might be mentioned that the cultivation of sugarcane by the Behar Planters' Association was not successful, and there was a considerable decrease in the area cultivated by them. During the latter part of the year Mr. Taylor commenced a series of experiments in connection with the chemical characteristics of some of the Economic Botanist's single plant selected seeds.

13. *Economic Botanist.*—Much of Mr. Woodhouse's time also was devoted to organising the work of the research and the teaching staff of the various sections under his charge, to laying out the botanical garden, and to exhibition work. His scientific work was chiefly connected with plant-breeding. During the *bhadoi* season, 1909, a number of leguminous crops was grown under observation and the seeds of a large number of single plants harvested from the plots. These along with samples collected from various parts of the province and from Saharanpur were sown again in June 1910 and are doing well, especially the local variety of soy-bean. In the cold weather a number of *rabi* pulse crops also was grown under observation, and some single plants selected as a basis for next year's work. The Agricultural Chemist is collaborating with Mr. Woodhouse in his work on pulse crops. He is also experimenting with millets. Sowings of kaoni (*Setaria italica*) and marua (*Eleusine coracana*) were not successful in 1909; but a large number of heads were collected from various parts of the province, which have been sown this year and are doing well. Last year's work on sugarcane was not very satisfactory, as the unfavourable season produced unevenness in the crop. During the present season observations have been much more satisfactory, and it will probably be possible to arrive at a provisional classification after the year's growth. The botanical work on sugarcane is carried out in collaboration with Mr. Taylor, and it appears that some interesting correlations between the botanical and chemical characters may occur. Mr. Woodhouse also commenced work on cucurbits. He grew 288 varieties under observation during the *baishak* season, but in future he will confine his attention to one genus at a time, as these crops require much space and irrigation. Cuttings of 45 varieties of cassava, procured from the Imperial Botanist in July 1909, were planted in the experimental area. The crop, however, does not appear to be suitable for growth under field conditions, as the plants have been badly injured by every gale. Mr. Woodhouse did some further work on cotton, spineless cactus, and tanning materials, the latter two not being very promising.

14. *Cultivation of Jute.*—A number of departmental experiments on jute were carried out at the Cuttack Agricultural Station. As in the last year, the best outturn was secured with an application of 100 maunds of cowdung, four maunds of super-phosphate, three maunds of kainite, two maunds of sulphate of ammonia, and two maunds of sulphate of magnesium per acre. This is a very heavy manure, and it is doubtful whether cultivators are likely to take up jute under such expensive conditions. One hundred maunds of jute fibre produced on this farm was sent to Hastings Jute Mill for valuation from the spinners' point of view, and the report on the quality was favourable. During the year it was intended to cultivate 40 acres of jute at the Chinsura Farm for seed purposes, but want of seasonable rain and irrigation difficulties made it impossible to prepare such a large area. Floods destroyed most of the crop, and as a result little or no seed was obtained. Jute cultivation has been practically abandoned by planters in Behar, and is not likely to be revived there unless the prices rise again to the level of 1907.

15. *Cultivation of Cotton.*—Several varieties of cotton were tried at the Chaibasa Farm. The distribution of the seed of Buri cotton was continued during the year, $13\frac{3}{4}$ maunds being supplied from this farm. At Sabour the different cottons of the province were grown on a series of plots under the supervision of Mr. Woodhouse. Of late years the Department has not given great attention to cotton cultivation as the prospects do not appear to be very promising in this province. During the year the Imperial Cotton Specialist visited Sabour and other places, and as a result of his recommendations further experiments are being made on the most promising varieties.

16. *Cultivation of Flax.*—Mr. E. Vandekerkhove, the Belgian Flax Expert, continued his work at Dooriah, in Muzaffarpur district, during the cold weather under his agreement with the Behar Planters' Association. Questions of retting, manuring, etc., and an experiment with native seeds occupied his attention. On the whole the year's crops were fairly good, but as they were grown on land which had been heavily manured either this year or last Mr. Vandekerkhove will continue his work on ordinary land and under more universal conditions. The Manager of the Dooriah Factory was

thoroughly satisfied with the work of the seed-barrow, which was supplied to him and has been given a good practical trial. The detailed results of Mr. Vandekerkhove's work have been separately published by the Association.

17. *Spineless Cactus.*—Plants of different varieties of spineless cactus were imported from America and tried in several places in the province. They failed everywhere except in Palandu, in the Ranchi district, where the plants have thriven and are now large enough to supply cuttings for further experiments elsewhere. It does not appear, however, that spineless cactus is likely to be useful as a famine fodder outside of Chota Nagpur.

18. *Agricultural Stations.*—A short account of the work done on each of the agricultural stations is given in Appendix I. The annual report on each station will be separately published as usual.

CHAPTER III.

Agricultural Experiments and Demonstrations conducted by Agricultural Associations and on Government, Wards' and Private Estates.

19. Agricultural Associations and Government and Wards' estates ought to be very important auxiliaries to the Department. If the results obtained on departmental farms are not made known to the general public the farms might as well cease to exist. The great importance of the work of Associations, etc., is that they furnish a means of visible demonstration by actual cultivation on improved lines in the midst of the raiyats' fields. During the year 106 members of Agricultural Associations and 28 others carried on experiments on various crops, and to them the thanks of the Department are due for their voluntary work. Although much remains to be done before the cultivator will be moved out of his time-established grooves, still a certain amount of progress in popularising new crops and improved methods has been made, and the progress would be still greater with more system and co-ordination. One defect of the present lines of work is the general tendency to experiment rather than to demonstrate. Experiment should, except in exceptional cases, be confined to departmental farms. After years of careful work the Department has now a number of definite recommendations to make. Obviously the first work is to establish these improvements in general use. This can be done only by concentrating attention on them in every district and by duplicating the experiments all over the province. Another defect is the frequency with which programmes of demonstration work are changed. A comparison of the programmes of recent years shows that in almost every district they are altered from year to year. It is impossible that a new crop or method, however excellent, will be established amongst a conservative people by a single year's demonstration. The correct method clearly is that each demonstrator should select a certain number of the Department's recommendations which appear to be suitable to his locality, and should confine his attention to these year after year until definite results are obtained and brought prominently to the notice of the raiyats. It is hoped that in future members of associations and others will, instead of experimenting on their own lines, demonstrate the improvements recommended by the Department, and that, instead of changing their demonstrations every year or two, they will confine themselves to one series until it is definitely established in the locality.

20. During the year the progress made in experimental and demonstration work was fair. It would be easier to review the work if the returns showed more details of climatic and other conditions, and if comparative figures for the local methods and varieties were added. The results obtained would also be more convincing if the experiments were conducted on larger areas. Steps will be taken to improve the work in these directions.

21. On the whole the season was not unfavourable except for the indigo and the late cotton crops. The three harvests of the year—*bhadoi*, *aghani* and *rabi*—were satisfactory.

22. *Paddy.*—Naturally the greatest number of experiments were conducted on this crop. Central Provinces *aus*, a non-indigenous variety

introduced by the Department, continued to gain in popularity. It was successful in Hazaribagh, Bankura, Murshidabad, Cuttack and the 24-Parganas. In the last-named district, under favourable conditions, the outturn rose as high as 44 maunds per acre. In Behar it was less successful owing to insect-pests and other adverse conditions. The experiments on this crop on the departmental farms seem to show that the seed tends to deteriorate, and should be renewed every three years. The experiments on Peshwari paddy at Bankura did not succeed. On winter paddy the results obtained were generally good. Of the varieties recommended by the Department, *dadkani* was successful in Birbhum, Purulia and the Patna Division, *badshabhog* in Purulia, Hazaribagh, Palamau and Patna, *samudrabali* in Birbhum and Hazaribagh, and *banktulsi* in 24-Parganas and Purulia. The transplanting of single seedlings, 9″ apart, was tried with good results by the Associations of the 24-Parganas, Patna, and elsewhere.

23. *Potatoes.*—The District Associations of Birbhum, Hooghly, 24-Parganas, Patna, Purneah, Balasore, and Sambalpore, the Nayagram Wards' estate in Midnapore, the Jaunbazar Wards' estate in the 24-Parganas, and the Madhupur estate in Cuttack had good results with the Naini Tal variety. The Patna potato did well in Birbhum, 24-Parganas, Hooghly and in the Chota Nagpur Division. The Cherapoonjee and Cuttack varieties, which were tried by the Angul Association, failed.

24. *Wheat.*—Buxar wheat was grown with success by the Midnapore and Angul Associations. Mozuffernagar wheat is reported to have been successful wherever it was grown except in Bhagalpur, where it failed for want of rain. Mozuffernagar wheat, which is a soft white variety, has been strongly recommended by the Department, and there is no doubt it is very suitable for the province in the matter of outturn, but owing to the growing preference of the trade for hard varieties of wheat our recommendation may have to be altered.

25. *Juanpur Maize.*—This crop was grown in different localities with, on the whole, a fair amount of success. Like Central Provinces *aus* paddy, it shows a tendency to deteriorate and the seed should be renewed every few years.

26. *Sugarcane.*—The *khari* variety gave good results in Shahabad, Birbhum and Balasore. In Birbhum the tenants of Khan Bahadur Mohammed Shams-uz-zuha have taken up this variety, and it is reported that it is now grown on an extensive scale in the locality. The shamsara and the red Bombay varieties also were successful in Bankura and Birbhum respectively.

27. *Jute.*—Experiments on this crop were not very numerous. It was grown successfully by the Associations of Hooghly, Balasore, and Angul, and on Government estates in Midnapore. It failed in Nadia owing to excessive rainfall. In Sambalpur, where the crop was introduced last year for the first time, the results were not very good, as it was grown on an unsuitable soil.

28. *Cotton.*—The results were not better than in previous years. *Buri, dharwar*, and some American cottons were tried by various Agricultural Associations in different parts of the province, but nowhere was the cultivation successful.

29. *Ground-nut.*—This crop continued to grow in favour. The great demand for seed during the year is an indication of its increasing popularity. It grows on soil which will produce no other crop. On saline soil in the Sundarbans a yield of 27 maunds per acre was obtained without manuring. It was grown with more or less success in Murshidabad, Jessore, Khulna, Bankipore, Cuttack, Sambalpur and Chota Nagpur.

30. *Other crops.*—Cabul gram was grown widely and with encouraging results in 24-Parganas, Nadia, Bankura, Hooghly, and in different parts of Behar. Oats were not a success, although several varieties were tried—Dumraon, Patna, Hazaribagh and Australian. Cawnpore barley was successful in Darbhanga, and it is reported that the grain showed a very marked difference from that of local varieties. Black and sky-coloured barley, (two huskless varieties) was grown successfully by Mr. Hay Webb in Darbhanga. Raipur mustard did well in Bankura. Other crops experimented with, which call for

no special comment, are Spanish gram, castor-oil plant, peas, Jamaica ginger, tobacco, *juar*, *maong* and onions.

CHAPTER IV.

Agricultural Education.

31. Up to 1909 the only provincial institution which provided a higher agricultural education was the Sibpur Engineering College. In view of the opening of the Agricultural College at Sabour it was arranged that the Agricultural classes at Sibpur should be finally discontinued in 1909. Owing, however, to delay in construction work, the opening of the Sabour College had to be postponed for a year; and there has been a consequent hiatus. To bridge this and to secure some continuity in agricultural training, four students of this province were given scholarships to enable them to study at the Poona, Cawnpore and Nagpur Colleges of Agriculture. They are now in the last year of their course.

32. The Sabour College is now practically ready to commence work. The buildings have been finished, and the fitting of laboratories, etc., is almost complete. A staff consisting of the Principal, the Agricultural Chemist, the Economic Botanist, Assistant Professors of Agriculture, Botany, Mycology, and Entomology, an Assistant Mycologist and an Assistant Entomologist is now in residence. With the addition of an Assistant Professor of Chemistry, Physics and Mathematics and of a Demonstrator in these subjects it will be at full strength. The prospectus and rules for admission have been approved by Government and published in the *Calcutta Gazette*. The College will be opened for teaching purposes in November next. In the first year it is proposed to admit only some 20 students, of whom one-third will come from Eastern Bengal and Assam. The year's work will be largely experimental. The suitability of the curriculum to the class of students available has to be tested and experience has to be gained in matters of college adminstration; so it is desirable that the number of students should be limited at first. Partly with this object of providing experience and avoiding dislocation of work and partly in order to bring the academic into conformity with the agricultural year, it has been decided that the first year's course shall extend from November 1910 to March 1912. It is hoped that during this period any defects in the provisional curriculum will be remedied and adjustment of details according to conditions effected and that in 1912 the curriculum and general arrangements will have assumed a permanent form.

33. In the larger and perhaps more important matter of agricultural education in schools there is no progress to record. In the Cuttack, Gaya, Dumraon, Hazaribagh and Burdwan schools, the agricultural classes created after the educational conference held in Simla in 1901 continued a more or less nominal existence. The question of their improvement was definitely taken in hand by the appointment of a Board of Examiners, consisting of the Director of Agriculture, the Deputy Director, and the Principal of the Sabour College. The Board examined the classes at Dumraon, Gaya, and Cuttack in January 1910. At that time there were no classes at Hazaribagh and no Agricultural teacher at Burdwan. The report of the Board is now under the consideration of Government.

34. *Cuttack Collegiate School.*—The classes were conducted by the Superintendent of the Agricultural Station at Cuttack. Admission was understood to be restricted to students of the first two classes of the collegiate school, but it appears from the report of the Board that all the seven boys examined by them (of whom five passed) were Entrance-passed students of the College. The classes were held two days in a week, and once a week practical instruction was given at the Departmental Farm. The attendance at the classes was poor.

35. *Gaya Zilla School.*—Here the classes are much more satisfactory. The teacher is a graduate and a diploma-holder of the Sibpur Agricultural Classes. Agriculture is taught in all the classes of the school. The number of students who received practical and theoretical instruction respectively was 225 and 259 as compared with 80 and 220, the figures of the previous year. The

practical classes are held in the garden adjoining the school, generally during evening hours. The medium of instruction is English for the higher and Hindi for the lower classes. The first- and second-class students are taught according to the syllabus prescribed by the Director of Agriculture. Of the seven boys who appeared at the examination held by the Board of Examiners in January last four passed. The Board were satisfied that the teacher was doing good work.

36. *Dumraon High School.*—In this school also there is some life in the agricultural classes. Agriculture is an optional subject, and is taught in the first six classes of the school. The boys, the majority of whom belongs to the cultivating classes, take considerable interest in the subject, and apparently profit by the instruction given. In January 1910 there were 69 boys on the roll of the classes. Attendance at the class-room lectures was good, but irregular at the garden, which is situated at some distance from the school. The syllabus prescribed by the Director of Agriculture is followed in the four higher classes; the lower are taught the agricultural portion of the Science Primer. At the examination held by the Board of Examiners in January seven students appeared, of whom five passed. The Board recommended that the agricultural classes in this school should be retained, as they were doing good work.

37. In accordance with the recommendations of the Board, Government has ordered that the agricultural teachers at the Gaya and Dumraon Schools, who have done good work in teaching nature study to all the classes, shall be retained for a further term of three years, and that the classes at Burdwan, Hazaribagh and Cuttack shall be closed for the present. This is not the place to discuss the large and very important problem of agricultural education in schools, on the solution of which general agricultural improvement so much depends. It is not a purely agricultural matter, but is bound up with the system of general education. It is sufficient to say that the whole question is now occupying the attention of Government.

38. *Deputation of students.*—Of the students who were sent to the Cornell University in America for training in Agriculture, the last two returned during the year. One of them, Mr. B. M. Chatterjee, is now employed as Farm Superintendent at Sabour. It is not at present proposed to send any more students to America. The subordinate officers of the Department, who were undergoing a course of training in Entomology and Mycology at Pusa, have returned and are working in the labortories at Sabour.

39. *General.*—The Agricultural Institute at Deoghar was closed in December 1909, and the Government contribution of Rs. 60 per mensem in aid of that institute has consequently been discontinued.

40. The practice of training sons of cultivators at the experimental stations was continued during the year, principally at the Cuttack Farm. These student-cultivators receive quarters at the farm and the ordinary local rate of pay for farm labourers. They are taught practical field work on improved lines and the use of manures and implements. They do not aim at Government service, the intention being that they should go back to their villages and improve the cultivation of their neighbourhood. The system offers a very promising means of spreading a knowledge of recommended crops and improved methods of agriculture, and an attempt is being made to extend it to other farms with the help of local agricultural associations.

CHAPTER V.

SERICULTURE.

41. The operations directed towards the improvement of the silk industry in Bengal, which were taken over from the old Bengal Silk Committee in 1908, have developed considerably during the year. The work is carried out by Babu A. C. Ghose, the Superintendent, who has under him a staff of Assistant Superintendents and Overseers in charge of nurseries. The general control and management are vested in a Committee consisting of the Director of Agriculture, the Collector of Murshidabad, and four representatives of the

principal silk firms in Bengal. During the year the Committee held four quarterly meetings, at three of which the Director presided.

42. Berhampore, where the Central Nursery is situated, is the head-quarters; and a number of small nurseries are situated in the chief cocoon-rearing centres of the Murshidabad, Birbhum and Midnapore districts. The principal cause of the decline of the industry was found to be the great prevalence of disease, specially pebrine; and the object of the Committee is to rear and distribute as widely as possible in the silk-rearing districts, through the agency of village nurseries, pure seed free from disease. A programme of work on these lines was drawn up and approved by Government, and that programme is being gradually worked out. The experience of the year shows that the object is in process of being achieved.

43. There was no outbreak of disease amongst the worms reared according to the Pasteur system from cocoons microscopically examined. The seeds of the nurseries grew steadily in popularity. About one-fourth of the outturn of all the nurseries was sold to the silk-worm rearers of Rajshahi and Malda in Eastern Bengal and Assam, but the local demand for healthy seed became so heavy that the Superintendent had latterly to refuse further supplies to that province. Requisitions for seeds, which were met as far as possible, were also received from Belgaum, Hyderabad, Ahmedabad, Gwalior, Dalgoma and other parts of India. To meet the demand for seeds two more rearing houses were added to the Berhampore Central Nursery. One rearing house in that nursery has been set apart, in accordance with the recommendation of the Silk Committee, for the purpose of maintaining the seed of breeds which are wanted at the different seasons. Six new nurseries were built during the year. Three of these are in the Murshidabad district, two in Birbhum, and one in Ghatal. The last represents the beginning of an effort to assist the rearing population of the Midnapore district. Most of these, though constructed, were not in full working order at the close of the year. The seven old nurseries and the five rearing houses of the Berhampore Central Nursery reared seed cocoons successfully. Altogether there are now 18 nurseries. As the overseers become more efficient and the mulberry lands established, the outturn increases and the management becomes more economical. The total receipts from the sale of seeds amounted to Rs. 6,566 as compared with Rs. 5,874 of the preceding year; and there was a small balance of profit on the working. It is hoped that next year every nursery will be able to show a profit.

44. The experiments conducted with Italian mulberry in the Central Nursery were successful. The mulberry was used for feeding the worms in the last stage, and was found to be specially beneficial when a few worms were attacked with grasserie. The experiments in the cold storage of seed and cocoons, which were continued at the premises of the Linde British Refrigeration Company, Limited, in Calcutta, proved a success. By this means the Superintendent has been able to prevent the spread of disease, especially pebrine. By this means also it has been found possible to delay the cutting out of the silk-worms and so to regulate the supply of seed according to demand. The worms produced under these conditions, moreover, look stronger and healthier than those reared in the ordinary way.

45. An important development is the institution of a class for the training of the sons of *bonâ fide* rearers. According to the scheme approved by the Silk Committee the sons of professional rearers up to the number of twelve will be given a year's course of instruction in the Central Nursery at Berhampore and six stipends of Rs. 8, per mensem are offered. A complete course in the selection of seed, the rearing of worms and the growing of mulberry will be given. To give effect to the scheme a teacher on Rs. 25 a month was appointed in April last. Six boys are now under training.

46. The fate of the Sabang Sericultural School has not yet been finally decided. A member of the Silk Committee and the Superintendent of Sericulture visited the school and reported unfavourably on it. The school is now practically closed, and its future depends upon the action of the District Board of Midnapore with which this Department is in communication.

CHAPTER VI.

Fisheries.

47. Mr. A. Ahmad, C.S., the late Commissioner of Fisheries, retained his appointment up to 31st March 1910. During the latter period of his tenure of the appointment, the preparation of his report occupied most of his time, and the ordinary work of the Fisheries Department was placed under the control of the Director of Agriculture on the 15th January 1910. The staff at that time consisted of three Assistants—Mr. B. Das, who had studied fishery work in Europe for a year with special reference to carp culture, Mr. S. N. Moshin, who had made a special study of carp culture in America, and Mr. S. N. Das, an officer with engineering qualifications, who had already worked for about a year in the Department. The last named, on receiving an appointment in the Sibpur Engineering College, resigned his post in the Fishery Department in April. Mr. Ahmad, in his published report has already dealt fully with all the work done by the Department during the continuance of his appointment; and this report is concerned only with the work of February to June 1910. Operations in connection with deep-sea fisheries have been given up, and for the future the Department will concern itself chiefly with the inland fisheries of the province. A scheme of work has been drawn up, which is now under the consideration of Government. During the five months under report the Fishery Assistants have devoted their time chiefly to two special lines of enquiry—(1) experiments in the artificial propagation of carp and (2) investigation into the spawning grounds of *hilsa*.

48. *Carp Culture.*—The carp, to which class belong the *rohu*, *katla*, *mrigal* and *kalbaus*, is the most important food-fish of the people of this province. Unfortunately the supply is diminishing steadily and markedly. There are several contributing causes—the reclamation of *jheel* land, the indiscriminate destruction of brood-fish and spawn for food, the absence of any means of replenishing the stock, and so on. The devising of means to check the decline is a very important matter. Apart from resort to legislation and protective measures, artificial propagation appears to be the only effective course. Hitherto the above members of the carp family have been known to breed only on running water, and never in confined water; and the universal custom is to stock tanks with fry collected for rivers. In Europe, however, artificial breeding in confinement is carried on with great success, and there appears to be no reason why this should not be the case in India. If it could be proved that under certain conditions carp will spawn in confined water, the drain on the river-fry would be stopped, and there would be an unlimited source of supply for the replenishing of inland fisheries. Experiments to this end are now occupying Mr. B. Das' attention.

Similar experiments were tried last year by Mr. Ahmed without success in the tanks of the Victoria Nursery at Narcoldanga, and at Siripur Farm, in Saran, under the supervision of Mr. Mackenzie. Their failure was ascribed to unsuitable conditions, and Mr. Das' first duty was to choose a place which furnished the most promising conditions. He finally selected Bhagalpur, where, on the advice and under the supervision of Mr. S. N. Das, the Engineer Assistant, four spawning tanks were constructed on an approved model. Unfortunately, whether owing to the want of rain or to the unsuitable position of the tanks, only one (that which received the overflow from the water-works) has been filled with water. However, another fairly suitable tank in the neighbourhood was secured, and these have been stocked with *mrigal* and *katla*. There is greater chance of success in Berhampore, where subsidiary experiments are being conducted in the tanks of the sericultural station, and in water kindly placed at our disposal by Babu Srivan Behari Sen. It was intended to repeat the experiment at Siripur under Mr. Mackenzie's supervision, but owing to the impossibility of getting water and brood-fish in time, the idea had to be abandoned. A number of difficulties have arisen in the course of the work due partly to adverse circumstances and partly to Mr. Das' want of acquaintance with conditions in the province. The experience, however, will be useful in the future. Even if the experiments are

unproductive of direct results, no doubt negative results will be obtained, and a large amount of information should be collected, which will be valuable when the experiments are repeated next year. In addition to this experiment, Mr. Das is making a general enquiry into the spawning habits of river carp.

49. *Hilsa Culture.*—Next to the carp the *hilsa* (*Clupea ilisha*) is the most important of the food-fishes of the province. It is not strictly speaking a fresh-water fish, its natural habitat being the sea, but it ascends the rivers for spawning purposes, and is found in large numbers between March and October. As in the case of carp, the supply of *hilsa* appears to be decreasing, and there has been a distinct decline in the number of fish caught during recent years. In America a similar decline was observed in the case of the shad, a fish allied to the Bengal *hilsa*. A remedy was found in the establishment of hatcheries, where the ripe shad are stripped of their eggs, which are then fertilised by means of spermazoa from the male fish and hatched artificially. The fry are then stocked in the rivers, and the result is a plentiful supply of fish.

A similar course is contemplated in the case of *hilsa*. But before hatcheries can be established, the spawning grounds, which are known to no one, must be located, because it is only at such places that ripe *hilsa* of both sexes are available. Mr. Moshin, who has studied shad culture in America, has been entrusted with this enquiry. Owing to our almost complete ignorance of the habits of *hilsa*, it was necessary to depute him to this work in March as soon as the fish appeared in the rivers. During these months he has been constantly on tour, visiting the principal places on the Ganges and its offshoots, and examining the condition and habits of the *hilsa* at different stages of its growth. If he should discover the spawning grounds, which appears to be not unlikely, hatcheries will be established next year.

Full scientific reports on their enquiries regarding carp and *hilsa* will be separately prepared by Mr. Das and Mr. Moshin when their work in connection with the fish is over for the year.

50. *Bheri Culture.*—The only other work of any importance that was carried on during the five months under report was an experiment in the economics of *bheri* culture. It was intended to carry out a proper scientific experiment directly under the officers of the Department. But owing to the delay in obtaining a continuance of the lease of the Bhamanghata *bheri* and to the impossibility of securing properly-trained agents while the prospects of the department were still vague, the experiment had ultimately to be made under the supervision of last year's lessee. The *bheri* has, however, been divided by the lessee into suitable compartments for keeping the different kinds of fish separate, which makes it possible to study and examine the growth of each class. Next year the Department should be able to take up the work in good time and to make a complete experiment on scientific lines.

51. Other matters connected with fisheries are under the consideration of Government.

CHAPTER VII.

Publication of Agricultural information and Supply of Seeds, Manures and Implements.

52. The following leaflets were published in English and the vernaculars and widely circulated:—

(1) Sugarcane and sugarcane experiments in Bengal.
(2) *Aus*, *bhadoi*, early or summer paddy (rice).
(3) Potatoes—Cultivation, manuring, varieties, storing and seed-supply in Bengal.
(4) Simple instructions on arboriculture.

The Quarterly Journal is gradually gaining favour with the public interested in agriculture. The Agricultural Statistics of Bengal for 1908-09, the Season and Crop Report of the province for 1909-10, a note on Sericulture in Bengal, and a report on the first Wage Census of Bengal were published. As usual reports on the agricultural stations were prepared and distributed.

53. During the year some modifications in the system of seed-supply were introduced. Formerly the whole business was concentrated in the Central Seed Store in Calcutta. It was found to be more than the Superintendent could manage effectively, and there was a certain amount of delay in supplying orders and of confusion in account keeping. The work has now to some extent been decentralised. Each farm has been made a centre for the supply to customers in its locality of the seeds of crops grown on the farm; and the Superintendent is responsible for securing payment. The Central Seed Store now stocks, in addition to special manures and implements, only seeds which are not produced on the departmental farms, together with such a quantity of farm-grown seed as is sufficient to meet orders from the neighbourhood of Calcutta. The system of accounts has also been overhauled.

The Central Seed Store and the Agricultural stations of this Department supplied during the year 2,442 maunds of seeds of various kinds, 437 maunds of manures, 81,650 sugarcane cuttings, and 193 implements of different kinds.

CHAPTER VIII.

Agricultural Associations and Shows.

54. Agricultural Associations, with their Divisional Inspectors, and Agricultural Exhibitions are the principal means which the Department at present possesses of disseminating a knowledge of agricultural improvements by actual demonstration. In addition to the Provincial Agricultural Association, there are six Divisional Associations and local Associations in all except three districts. The function of the Provincial Association is to consider and advise upon questions of general agricultural importance; that of Divisional Associations is to co-ordinate the work of District Associations and to serve as a convenient channel of communication; while the members of District Associations are expected to take a practical part collectively and individually, both by consultation and by actual demonstration work, in the improvement of agriculture in each district. Most of the Associations are still young, and it will be some time before they attain their full usefulness.

55. *Provincial Association.*—Three meetings were held during the year—in August, December and April. Two new members—Mr. M. Mackenzie of Siripur, Saran, and Rai K. C. Banerjee Bahadur, retired Superintending Engineer—were added to the list. The interest of those who were able to attend regularly was well sustained throughout the year.

56. *Divisional Associations.*—On the whole there has been no marked development of activity, nor have the Associations shown a very vigorous separate existence. Individual members in all have done excellent work, and have been of much assistance to the Department, but collectively the work of these Associations has generally been confined to the distribution amongst the District Associations of the divisional grant of Rs. 1,000, to the arranging of the Divisional Inspector's programme, to the distribution of departmental leaflets, and to the forwarding of programmes of works and of reports from their affiliated bodies. Most interest appears to have been shown by the Orissa and Patna Divisional Associations. The former holds its meetings at the Cuttack Farm—a practice directly instructive to all. At one meeting a large gathering of raiyats from Government and Wards' estates and from several private estates attended. The Chiefs of the Feudatory States, who are members of the Orissa Association, maintained experimental farms in their territories. In Patna the survey and settlement operations distracted the attention of members to some extent. The Divisional Association has shown activity in connection with various pests. It supervised, through the agency of the Inspector, a very useful experiment on the storage of potato-seeds under sand as a preventive against the attack of moths. The Bhagalpur Divisional Association was unable to accomplish as much as it hoped to do, partly at least owing to the deputation to other work of the Agricultural Inspector. It should be possible next year to make full use of the farm at Kajra, placed at the disposal of the Association by

Raja Kamaleswari Prasad Singh. With the opening of the College at Sabour it is hoped that this Association will become a more active institution.

57. *District Associations.*—The most effective district associations are found in the Orissa Division. The Sambalpur Association is probably the most active in the province at present. Its success is due not only to the enthusiastic interest shown by the President, Mr. M. Moberly, I.C.S., but also to the fact that all the members are practically and keenly interested in agriculture. Substantial progress has been made in the introduction of new crops, methods and implements. Thirteen branch associations have been formed, and one of these (Barasambar) has created sub-committees in every Patwari circle. In Angul too good work has been done. As in Sambalpur, branch committees have been formed under the presidents of rural police circles, and here again the members are practical agriculturists. The other associations of the province are less active. One, that of Howrah, is dead, and several have very little life. Others, such as Bankura, Birbhum, etc., have attached to them trained cultivators and small farms or gardens, through which agency they do some useful work. They have not yet reached that stage when they can be called really effective institutions. The most that can be said at present is that the majority contain the promise of better things. In every association, however, keen individual members are found, and already with their help some progress has been made in improving the agriculture of different localities. It is impossible to give a complete list of those who have done useful work in connection with agricultural associations. Special reference may be made to Babu Saroda Charan Mitra, Rai Lalit Mohan Sinha Roy Bahadur of Chakdighi and Babu Purnendu Narayan Sinha, Secretary of the Patna Association. Amongst the members of the local associations who deserve special mention are Rai Kali Bhushan Ghose Bahadur, Babu Jitendra Nath Bose, Mr. Kanak Rai of 24-Parganas, Babu Trailakya Nath Chatterjee and the Manager of the Syedpur Trust estate in Khulna, Raja Baikuntha Nath De Bahadur of Balasore, Babu Kamakhya Prasad Ganguli of Murshidabad, Babu Paran Chandra Pal of Bankura, Khan Bahadur Mohammed Shams-uz-zuha of Birbhum, Babu Ambica Prosad, of Patna, Babu Hari Har Prasad of Dumraon, and Babu Bhubaneswar Bohidor, Dewan of Barasumbar in Sambalpur.

58. *Agricultural Inspectors.*—These are the principal agents of the Divisional Associations. One is attached to each division, except in case of Bihar, where the Patna Inspector has to cover both Patna and Tirhut. The area is too large, and it will soon be necessary to appoint a special man for Tirhut. These Inspectors are utilised to make special enquiries for the Department; but their chief and proper work is to visit each district in turn, to assist the members of the District Association in their demonstration work, and to do all in their power to spread a knowledge of improved agriculture throughout their areas. The Divisional Inspector is a very useful institution, and most of these officers have worked energetically throughout the year.

59. *Agricultural Shows and Fairs.*—Twenty-six agricultural and cattle shows were held in different parts of the province, to which grants-in-aid, amounting to Rs. 6,978, were made. At most of them the Department was represented by an officer with a collection of exhibits, including seeds, manures and implements. Messrs. Woodhouse, Taylor and Smith attended most of the important shows, and Divisional Inspectors the remainder. Mr. Woodhouse continued to give special attention to exhibitions and did very useful work. The use of improved implements was demonstrated: results obtained on departmental farms were brought prominently to notice by means of diagrams; leaflets in the different languages were distributed, and magic lantern lectures on agricultural subjects were delivered. If properly organised, these exhibitions would be a most effective means of bringing the departmental recommendations to the notice of cultivators. Hitherto it has not been possible to make use of them to the fullest advantage largely because most of the shows are held within a very short period in February and March, and our staff is too small to enable us to give adequate attention to each. Arrangements are now being made to systematise the work of the Department connected with these exhibitions, by which it is hoped to make them more useful to all concerned. Success, however, will depend on how far the local authorities are willing to alter the dates of their shows to suit our requirements.

A brief account of each show is given in Appendix II.

CHAPTER IX.

MISCELLANEOUS.

60. *Crop-cutting experiments.*—The usual experiments were conducted during the year, the returns for which are still coming in. The number of experiments conducted was almost the same as in the preceding year—887 as compared with 900. There is still much room for improvement in the number and quality of the crops selected for experiment.

61. *Mycology.*—Babu Promotho Nath Bhattacharjee, the Assistant Mycologist, was on deputation at Pusa until April owing to the absence of accommodation at Sabour. While at Pusa he attended the mycological laboratory and examined an important disease of rice, known as *dakhina* or *chatra*, which appears to be of general occurrence in Bengal. He further examined a *circospora* disease of soy-beans, which appeared in the Sabour Agricultural Station, and also diseases of papaya, *pui*, *kachu*, beans, and several fruits, which occurred at Pusa. Six excellent show-cases illustrating the commoner diseases of the province were also prepared by him with the assistance of the Imperial Mycologist's staff for use at agricultural exhibitions in Bengal. Mr. S. K. Basu joined the Department in April as Assistant Professor of Mycology, and since then has been engaged in supervising the fittings, arranging the Mycological Laboratory, and checking and arranging the stores. A collection of mycological specimens has been made and mounted for the College herbarium. Investigation of smut on sugarcane has been taken up at Sabour, and a rather serious mango disease has been partly investigated. A report on the principal fungus diseases of crops and economic plants of Bengal dealt with by the mycological laboratory at Pusa during the year under report, which has been kindly supplied by the Imperial Mycologist, is printed as Appendix III.

62. *Entomology.*—Like the Assistant Mycologist, Babu D. N. Pal, the Assistant Entomologist, was on deputation at Pusa during the greater part of the year. Mr. H. L. Dutt, the Assistant Professor of Entomology, was also on training at Pusa up to 14th May when the Entomological section was moved to Sabour.

During the year collections of some 800 economic and teaching specimens were made. Through the kindness of the Imperial Entomologist the available information regarding, and specimens of, the insects of economic importance in the province have been supplied, and the Entomological section will now be able to make a fair start in its permanent quarters in the College. A set of 24 Entomological plates with English and vernacular descriptions and a number of silk and lac samples and insecticides were prepared for exhibition at agricultural shows. The Imperial Entomologist has kindly forwarded a memorandum of insect-pests reported to him from Bengal during the year, which will be found in Appendix IV.

63. *Pests.*—The pests reported during the year were not so serious as those of the previous year, which was probably due to the better season.

(*a*) *Paddy crops.*—The paddy crops of Birbhum, 24-Parganas, Nadia, Balasore, Sambalpore, Singhbhum and Ranchi were damaged to some extent by insect-pests.

(*b*) *Rabi crops.*—At the commencement of the *rabi* season the crops of 20,000 *bighas* on Mokameh *tal* lands were destroyed by cut worms (*agrotisypsilon*), and preparations are being made for taking preventive measures on a large scale in co-operation with the Imperial Entomologist during the coming season. Damage to *rabi* crops was reported also from Dharara and the *tal* lands of Pali and Barahia in Monghyr district. The remedy suggested was to scatter about the fields heaps of grass under which the caterpillars would crawl at night and so could be destroyed in the morning. The oilseed crops of Monghyr, Shahabad, Saran, Champaran and Darbhanga were damaged by insects to some extent.

(*c*) *Other crops.*—In June 1910 maize was reported to be attacked by hairy caterpillars (*Amsacta, Lactinea*, etc.) at Dumka (Sonthal Parganas). Hand-picking and digging of trenches (to be kept filled with rain water) between the fields and the uncultivated land were recommended, together with the clearing of the surrounding *parti* lands. The

maize on the Sabour Farm was also attacked by a mothborer, but the damage was not serious as only the newly-formed tassels were attacked, and they were picked off and buried. In September the sun-hemp in the Sabour Farm was found to be badly attacked by the sun stem-borer, *Laspeyresia Preudonectis*. In March 1910 vines at Behala (24-Parganas) were reported to be attacked with *Aleurodes nubilans*. Hand-picking on a small scale or spraying with tobacco decoction on a large scale was recommended. Among garden-pests, *Pieris brassicae* was reported from Dugmara, Bhagalpur, and surface grass-hopper from Purnea. Hand-picking and bagging were recommended for these pests respectively.

64. *Potato-moth.*—The work of demonstrating the best methods of combating the potato-moth (*Pthorimea operculetta*) of Patna were continued. The methods recommended were (1) the storage of tubers under sand and napthalene and (2) storage of the tubers under sand after they had been dipped in a solution (1 in 32) of crude oil emulsion. A godown was rented to carry out the demonstration, and cultivators were persuaded to store their tubers in the manner recommended. Good results were nct obtained in the lots treated with crude oil emulsion, but the practice of storage under sand was successful, and has been adopted by a number of cultivators.

65. *Locusts.*—Locusts did not appear anywhere in the province during the year except in Baharagura thana, in the district of Singhbhum, where the extent of damage done was only 5 per cent.

66. The Agricultural Department is much indebted to the officers of the Agricultural Research Institute, Pusa, who have always readily given all the assistance asked for.

67. *Indigo.*—Government has undertaken to make an yearly grant of Rs. 32,500 for five years to the Behar Indigo-Planters' Association on condition that the Association subscribes Rs. 10,000 annually. Mr. C. J. Bergthiel was in charge of the Indigo Research Station at Sirsiah. Mr. F. R. Parnell took up his appointment as Botanist on the 10th October 1909. The Advisory Committee, consisting of five practical planters, the General Secretary to the Behar Planters' Association, and Mr. Bergthiel, held 12 meetings during the year—4 at Sirsiah and 8 at Muzaffarpur.

An up-to-date potculture house with necessary scales, etc., was erected this year at a cost of Rs. 2,755.

During the year the following reports were issued by the Sirsiah Committee:—

(1) A precaution to take in handling sulphuric acid packed in iron drums (Bergthiel).
(2) Directions for use of sporulating dishes (Bergthiel).
(3) Report of the Sirsiah Sub-Committee.
(4) Mr. Bergthiel's report for 1909-10.

A detailed report on Mr. Bergthiel's work under the Sirsiah Committee has been separately published and a copy of it submitted to Government. No results have yet been obtained of sufficient finality to warrant publication.

68. *Arboriculture.*—By the Manual of Arboriculture the duty of supervising the progress of arboricultural work in the province has been imposed upon the Director of Agriculture. Hitherto the work has been somewhat overlooked, and during the year attention has been given to placing it upon a proper basis. Instructions were issued to all district officers regarding the treatment of arboricultural work on roads under the District Boards, and the work of the previous year was reviewed. Enquiry has revealed great divergences of practice in the matter of working plans, etc., and has raised important questions regarding the functions of this Department and the provision of funds, which must be settled before any orderly progress is possible. These are being referred to Government. The class for the training in arboriculture of overseers and other subordinates of District Boards was held from the 10th August to the 9th September at the Sibpur Botanic Garden. The Superintendent reports that the 14 overseers from 13 districts who attended the course paid attention to the theoretical and practical instruction given to them, and seemed to have understood the subject fairly well.

69. *Well-boring operations.*—Very little progress has been made, and the creation of an efficient well-boring organisation is still in the future. The demand for borers was small, and the staff was accordingly reduced. Only 38 borings were made—12 in Gaya, 10 in Bhagalpur, 8 in Patna, 6 in Shahabad and 2 in Motihari. Even with a reduced staff it was found very difficult to control the borers of the different districts and to get reliable data for working out the economics of well-boring. The whole system appears to require readjustment, and this matter is now under consideration. Success seems to be largely a question of the controlling agency. For the present an obvious lesson of the year's work is that, if the present lines are continued, the work must be concentrated. Accordingly at the close of the year, the head-quarters were removed from Sabour to Gaya, to which district the work will be for the present confined.

70. *Rainfall stations.*—During the year five new stations were sanctioned in the district of Hazaribagh. The statement below gives the number of rainfall-registering stations in each district and the number inspected during the year. In some districts inspections were few in comparison with the number of stations, and in others no inspection appears to have been made.

Names of districts.	Number of rain-gauge stations.	Number of rain-gauge stations inspected.	Names of districts.	Number of rain-gauge stations.	Number of rain-gauge stations inspected.
Burdwan ...	5	3	Monghyr	10	3
Birbhum ...	6	...	Bhagalpur ...	8	...
Bankura ...	10	8	Purnea	7	1
Midnapore ...	27	...	Darjeeling ...	6	...
Hooghly ...	3	1	Sonthal Parganas ...	21	1
Howrah ...	4	4	Cuttack	8	4
24-Parganas ...	10	3	Balasore	10	1
Nadia ...	6	5	Angul	5	2
Murshidabad ...	10	5	Puri	7	...
Jessore ...	5	4	Sambalpur ...	3	3
Khulna ...	12	6	Uriya Feudatory State	7	...
Patna ...	8	1	Orissa Tributary Mahals	18	1
Gaya	11	4	Hazaribagh ...	8	4
Shahabad ...	17	1	Ranchi	10	3
Saran ...	13	...	Palamau	20	6
Champaran ...	8	4	Manbhum ...	10	7
Muzaffarpur ...	16	...	Singhbhum ...	12	5
Darbhanga ...	11	5			

71. *Agricultural Implements.*—A table of agricultural implements reported to have been tried in the province during the year is given in Appendi V. Both the iron mill for crushing sugarcane and the pan for boiling juice were greatly appreciated by the sugarcane-growers of the Orissa Division. The use of the Meston plough has extended considerably.

72. *Officers of the Department.*—During the year the Deputy Director showed much energy in inspecting his farms. Mr. Dobbs gave great assistance in well-boring matters, in supervising the completion of the College buildings, and in making preparations for the opening of the College. Mr. Taylor and Mr. Woodhouse did some valuable scientific work, and the latter rendered specially useful help in connection with exhibitions. On the rest of the College staff the reports are satisfactory. Babu A. C. Ghose carried on the sericultural work efficiently and energetically. The Travelling Inspector, Babu Nibaran Chandra Choudhury, again proved himself a useful assistant in various ways. The Divisional Inspectors on the whole worked with energy. Of the Farm Superintendents, the Deputy Director again speaks well of Babu Kishory Mohan Ghose, Dumraon, and Babu Raj Nath Ray, Cuttack. My Personal Assistant, Babu Nagendra Nath Sircar, has done valuable service in bringing the accounts of the Department into order, and his work in all branches has been uniformly good and thorough. I am indebted to him for much assistance.

APPENDIX I.

Agricultural Stations, 1909-10.

Burdwan.—The total area of this station is 31 acres, of which 25 acres are under cultivation, the remainder being under roads, buildings, tanks and channels, etc. At this station the work on paddy, jute and potatoes on the lines of the previous years was continued, but there are no results to publish that have not already appeared in previous annual reports. The results obtained during the year only corroborated those of previous years. The most important conclusions may thus be briefly summarised:—

(1) The Burdwan district can produce fibre equal to good Narainganj jute. The employment of Narainganj seed is necessary.
(2) Jute and paddy in rotation suit the Burdwan district.
(3) The rotation of jute and potatoes is an excellent practice for the district.
(4) Three maunds of bonemeal *plus* one maund of saltpetre per acre is an economical manure for paddy.
(5) Green manuring with *dhaincha* is an economical practice in paddy cultivation.
(6) Twenty maunds of castor-cake per acre is an economical manure for potatoes.

This station has now reached the stage when it should be made into a centre for disseminating knowledge and seed. For this purpose the farm should be supplied with commodious *pucca* buildings, while the area should be fenced and a well-educated man should be placed in charge of the work. It is proposed to carry out only demonstration work in future. The total expenditure during the year amounted to Rs. 4,089-3-7 only and the receipts to Rs. 1,809-13-3 as compared with Rs. 4,381-0-11 and Rs. 2,049-8-3, respectively, in the preceding year. The cost of the upkeep of this station is borne by the Maharajadhiraja of Burdwan to whom this Department is indebted.

Chinsura.—This station comprises an area of 210 acres. Work of laying out was pushed on during the past year. Buildings have been erected, and all experimental work for the Burdwan Division will be carried out at this station. Results so far show that we have not yet obtained uniform conditions suitable for experimental work. A large amount of paddy, jute and *dhaincha* seeds were distributed from this station during the year as a result of the last year's work. The expenditure at this station during the year amounted to Rs. 11,773-13-6 and the receipts to Rs. 4,325-4-6 as compared with Rs. 15,335-6-3 and Rs. 138-5-9, respectively, in the previous year. The charges on account of this station are borne by Government.

Bankipore.—The farm comprises an area of 210 acres and is gradually being brought under control, and may be expected shortly to be in full working order. Results show that we are still dealing with ununiform conditions. Excellent crops of paddy, sugarcane, *juar* gram, wheat and peas have been grown on this farm, and we may look forward to the farm being a good distributing centre for seed of these crops. We were able to distribute a large amount of seed as the result of the past year's work. Very shortly we shall have a good set of labourers' quarters when student-cultivators may come to this farm to receive practical training in the same way as at the Cuttack Station. The expenditure during the year amounted to Rs. 13,622-12-6 and the receipts to Rs. 2,891-5-9 as compared with Rs. 17,239-4-6½ and Rs. 1,271-6-2 in the previous year. The charges on account of this station are borne by Government.

Dumraon.—This station has an area of 30 acres, of which 22 acres are under cultivation and the remainder is made up of channels, roads, buildings, etc. Sugarcane and wheat are the two main crops under experiment at this station, but paddy and other crops receive attention. The year 1909 was a very unsatisfactory one so far as rainfall is concerned. An exhaustive summary of the results of the sugarcane experiments at this station was made in the Annual Report for 1908-09. The manurial experiments carried out on this crop this year show that sulphate of ammonia along with castor-cake or saltpetre along with castor-cake are very economical manures. As regards wheat, we have nothing new worth recording. Mr. Howard at Pusa has done excellent work on this crop during the past few years, and we hope some of his varieties will be available shortly for this province. Mr. Howard's varieties are hard and rust-resisting. The results obtained on the paddy crop this year corroborate the previous conclusions we came to on the prolificness of *maharajwa* and *bansful* varieties, and demonstrate the economy of 50 maunds of cowdung, green manuring with *dhaincha* or cowdung *plus* castor-cake as manurial applications for this crop. The work on other crops corroborated what has already been said in previous years. A large amount of seed grown on this station was distributed during the year. The total expenditure at this station during the year was Rs. 2,539-8-6 and the receipts Rs. 1,344-8-9 as compared with Rs. 2,659 and Rs. 1,495-0-6 in this year. The expenses of this station are borne by the Dumraon Raj estate, which is now under the Court of Wards, but the entire management is in the hands of the Bengal Agricultural Department.

Cuttack.—During the past year the farm area was increased from 70 to 120 acres, and is now regarded as the experimental station of the Department representative of the Orissa

Division. The increased area is now in process of being brought under control. Roads and channels have been constructed, and the necessary laying out operations are now being carried out. Experiments on jute, *aman* paddy, *aus* paddy, sugarcane and ground-nut were carried out. So far as the jute crop is concerned on this station, heavy manuring is essential if a crop worth harvesting is to be obtained. The quality of the jute grown on this farm is equal to good Narainganj. The original object of this farm was to prove the advantages and economy of canal irrigation in Orissa, and it may be noted that, with regard to the use of water on the *aman* paddy crop without irrigation, the crop is precarious. If the season is favourable, a crop may be obtained, otherwise the crop is doomed. As to the quantity of water to apply, there is so little difference between 3 inches and 6 inches in the outturns obtained that it would seem superfluous to use the extra 3 inches of water. So far as manure for the paddy crop is concerned, we cannot at present recommend anything but 50 maunds of cowdung per acre or green manuring with *dhaincha*. The outturn from transplanting one seedling per hole has been so much greater than that from 2, 4 or 8 seedlings per hole this year that, apart from the enormous saving of seed in the seed-bed, the larger crop obtained has to be considered. Continued success is being obtained with the Meston plough for paddy cultivation. The only fact regarding the *aus* paddy crop worthy of note is that Central Provinces *aus* appears to be losing its vigour. New seed will be brought in from Sambalpur this year for comparison. The local variety gave the best return, while the worst was obtained from the Japanese variety of paddy, *kinshiu*. This only further corroborates our experience that if prolificness is to be maintained, seed must be changed every few years. The *khari* and *mungo* varieties of sugarcane again proved themselves suited to Orissa, while ground-nut and turmeric continued to give economic results on poor soils. Potatoes were so badly affected by disease as to be uneconomical. The farm also distributed a large quantity of seeds during the year under report. The following have received practical training during the past year: 2 Farm Overseers and 4 student-cultivators.

The expenditure during the year amounted to Rs. 9,750-0-3 and the receipts to Rs. 4,986-15-1 as compared with Rs. 7,499-0-4 and Rs. 5,270-5-3 in the previous year. The charges on account of the farm are borne by Government.

Chaibasa.—This station has an area of 54 acres, of which 31 acres are under cultivation and the remainder is made up of roads, buildings, hillocks, tank, etc. The work of previous years was continued during the period under review. The disease of *tasar* caterpillars again showed itself, and efforts are being made to find remedies for the pest. A fact that is worthy of note is the great success we obtained with the ground-nut crop. An outturn of 28½ maunds per acre was obtained. This crop grew luxuriously on land that previously in spite of every effort refused to grow anything. This should be noted for the Kolhan, for there are many areas that are unproductive at present and which are unirrigable through being on high land. Thirty maunds of *buri* cotton seed and 20 maunds of ground-nut were distributed from this station during the year. The expenditure during the year amounted to Rs. 3,219-6-6 and the receipts to Rs. 361-6-6 as compared with Rs. 2,496-2-6 and Rs. 163-3 in the previous year. The charges on account of this station are borne by Government.

Kalimpong.—In conjunction with the St. Andrew's Colonial Homes at Kalimpong a demonstration farm was opened at Kalimpong in April 1907 for the district of Darjeeling. The area of the farm land is about 60 acres. The Government subsidy is Rs. 5,000 per annum for five years; the agricultural practices of this part of the Himalayas in the district of Darjeeling are being tested, and the definite figures for the cost of cultivation of the chief crops of this tract with the outturn per acre are being worked out. In 1909 an outturn of 37½ maunds of maize per acre was obtained. In addition to the ordinary crops a thorough experiment is being made with English fruit trees to find out their suitability to the Kalimpong hills, and seedlings of the most important trees have already been obtained from the Royal Nurseries, Maidstone, England. These will be properly treated and their progress year by year will be carefully recorded.

Sabour.—The laying out of the farm was continued during the year, but a considerable amount of levelling has still to be done in the experimental plots to ensure fairly uniform conditions. Some of the high lands were laid out for students' cultivation in small plots. Experiments were carried on with a view to determining the comparative cost of different methods of lifting water. A conservative system of cropping has been adopted. Mr. Sil, the Assistant Professor of Agriculture, continued his work on the selection of *rahar*, and supervised the growth of a large number of varieties of rice for comparison. During the year under report the yield of the farm crops was moderate, but the mango crop was a complete failure. The receipts for the year were Rs. 3,481 as against Rs. 4,365 in the previous year, and the expenditure was Rs. 14,635 as against Rs. 10,000 in 1908-09.

APPENDIX II.

Agricultural Shows and Fairs.

Chinsura Agricultural and Industrial Exhibition.—The fourth Agricultural and Industrial Exhibition of the district of Hooghly was held at Chinsura from Saturday, the 12th February, to Wednesday, the 23rd February 1910. The actual number of exhibits both of the Agricultural and Industrial sections was 2,332. The exhibits of the Agricultural

Department were also numerous, and were arranged in a separate shed under the charge of the officers of the Department. *Gur* was manufactured by them from sugarcane, and the Department also sent a large number of agricultural implements. The financial position of the Committee was satisfactory. Although the amount of public subscriptions has fallen, the Committee succeeded in securing a profit of about Rs. 800. The Department contributed Rs. 300 to the fund.

Bankura Agricultural and Industrial Exhibition.—The fourth exhibition was held from the 12th to the 21st February 1910. Some 8,000 persons visited the exhibition, and but for an epidemic of small-pox in the town the number would have been larger. The Deputy Director of Agriculture, Bengal, and the Divisional Agricultural Inspector were present, and gave lectures and demonstrations. The exhibits were numerous and were arranged under the three main heads of (1) Field and Garden Crops, (2) Manufactured and prepared articles, and (3) Agricultural Implements. The sericultural exhibits of the Government Sericultural Department attracted much attention. The Industrial section was interesting. The noteworthy feature of this year's exhibition was the increase in the number and improvement in the variety and quality of local exhibits in the Agricultural section. The Department contributed Rs. 300, and Rs. 100 was granted by His Honour the Lieutenant-Governor.

Suri Cattle and Produce show.—The 14th show was held on the 28th January 1910 and lasted for four days. Mr. Smith, the Deputy Director of Agriculture, Bengal, was present at the show and gave a lantern lecture. An Inspector of the Agricultural Department was also present, who explained the use of the improved agricultural implements, seeds, and manures that were exhibited by the Department. The exhibits in the Cattle section this year were far more numerous and of better quality than in the preceding year, and those of the Agricultural section, though smaller in number, were good. The number of visitors was over 15,000. Prizes to the value of Rs. 765 and medals and certificates were awarded. The show was a success. Rupees 300 was contributed by Government. A sum of Rs. 150 was kindly granted by His Honour the Lieutenant-Governor during his visit to the *mêla* this year.

Kesherpahar Exhibition.—This year the exhibition was held from 22nd to 28th of February. The Agricultural exhibits consisted of different varieties of paddy, wheat, pulses, oil-seeds, *buri* and Egyptian cotton, potatoes and other vegetables, several varieties of sugarcane and fodder grasses, cassava, silk cocoons and silk threads. This collection shows the increased interest the raiyats are taking in the exhibition. The Agricultural Inspector, Burdwan Division, was deputed by the Agricultural Department with exhibits of seeds, implements and manures. He lectured to the raiyats regarding manures, implements and improved methods of cultivation. He also made practical demonstration with the local Burdwan, Meston and Hindustan ploughs. The superiority of the Hindustani plough was admitted and several ploughs were ordered. *Gur*-making was also practically demonstrated. The exhibition was a success.

Banjetia Industrial and Agricultural Exhibition.—This exhibition was opened on the 1st March 1910. Mr. Smith, the Deputy Director of Agriculture, gave a lantern demonstration which was much appreciated. The exhibits of the Industrial section were interesting. The agricultural exhibits were good, though not many. In the live-stock section there were locally-bred bullocks, rams, lambs, etc. The Department contributed Rs. 250 to the funds.

Jessore Industrial and Agricultural Exhibition.—The second exhibition was held from 23rd February to 9th March 1910. It was opened by His Honour the Lieutenant-Governor during his visit to that place. The exhibition was divided into four sections, viz. (1) Agricultural, (2) Industrial, (3) Cattle Show and (4) Amusement. The collection of agricultural exhibits was not much superior to that of the previous year owing to the cyclone which visited the district in October last. The Department sent a large collection of agricultural implements, machines and seeds in charge of the Divisional Agricultural Inspector. The exhibits in the industrial section numbered 2,230. Prizes were given this year on a more liberal scale, Rs. 1,468-8 being spent on them. His Honour the Lieutenant-Governor made a donation of Rs. 250 to the exhibition and the Department contributed Rs. 250.

Khulna Exhibition.—The eighth exhibition was held in the town of Khulna from the 16th to 25th February 1910. It was opened by the District Magistrate, R. C. Hamilton, Esq., I.C.S. The exhibition was divided into three sections, viz. (*a*) Agricultural, (*b*) Industrial and (*c*) Arts. The agricultural products of the district of Khulna only were admitted as exhibits, the total number of which was 879. Of the exhibits, paddy, rice, jute, cotton, potatoes (Naini Tal and Patna) and vegetables as well as fruits and dairy produce were specially mentioned. Owing to the cyclone in October 1909, the agricultural exhibits were not such as were expected. The Divisional Agricultural Inspector was present with his exhibit of seeds, manures and implements. He explained the use of the implements to the people. Altogether Rs. 632 were spent in awarding prizes and medals. On the 23rd February, His Honour the Lieutenant-Governor of Bengal, with the Commissioner of the Division, visited the exhibition. The Agricultural Department contributed Rs. 500.

Basirhat Industrial and Agricultural Exhibition.—This, the third Annual Show, was held from 15th to 18th February 1910. The number of exhibits this year was greater than in the previous year. A Travelling Inspector of this Department and the Deputy Director of Agriculture attended this show. Prizes to the value of Rs. 207 was given to the competitors. The Department contributed Rs. 200 to the funds.

Barasat Industrial and Agricultural Exhibition.—The exhibition was held from 14th to 16th February 1910. There were altogether 418 exhibits both in agriculture and arts. Rupees 125 8 was spent in prizes for agricultural exhibits, Rs. 74-8 for arts and Rs. 42-12 for prizes to the successful competitors in the sports. There was an improvement in the number of exhibits this year. The Deputy Director of Agriculture visited the show and gave a lantern demonstration. A subordinate officer of the Agricultural Department also attended the show with agricultural exhibits. Government contributed Rs. 200 in aid.

Bankipore Industrial and Agricultural Exhibition.—The sixth exhibition was held from the 12th to 15th February 1910. In the Agricultural section the exhibits were more numerous and more various than in previous years. The Agricultural Department had a large collection of exhibits under the charge of the Economic Botanist, which attracted much attention. The working of the following implements were shown:—paddy-thresher, paddy-winnower, chaff-cutter, maize-huller, cane-crushing mills. The process of reeling was shown by the reelers from Pusa. There was also an exhibit from the Fishery Department. The lantern demonstration given by the Deputy Director of Agriculture was well attended and much appreciated. Dairy products were fairly represented. The Industrial section was good. Looms of various improved patterns were shown in working order by Mr. Hoogewerf, Principal, Serampore Weaving College, and his assistants. The total receipts and expenditure of the exhibition during the year were Rs. 3,851-2 and Rs. 2,954-8-3, respectively. The Department contributed Rs. 500 to the funds.

Bihta Agricultural and Industrial and Cattle Show.—The seventh Bihta Agricultural and Industrial show was held from the 9th to 11th March 1910, in connection with the *Sivaratri Mêla*. There were more than 8,000 cattle in the *mêla*, the number exhibited being 137 against 142 of the previous year. The cattle exhibited this year were much better in quality than formerly. Twenty-six prizes, amounting to Rs. 171, were awarded. The agricultural exhibits were 278 against 237 and industrial exhibits were 857 against 837 of the last year. Mr. E. J. Woodhouse, Economic Botanist to Government, attended the exhibition with a large number of exhibits, which were much appreciated by the cultivators. Demonstration of the working of a number of agricultural implements was given. The working of the well-boring machine was also explained in detail. The Deputy Director of Agriculture, Bengal, Mr. F. Smith, gave a lantern lecture showing improved methods of cultivation, manures, ploughs, etc. The Department contributed Rs. 150 in aid of the show.

Muzaffarpur Exhibition.—The scope of this Agri-Horticultural Exhibition was extended to the several districts of the Division, and an Industrial section was added. Local committees were formed in each of the districts of the Division for the collection of subscriptions and exhibits. The exhibition was held on the 26th and 27th January 1910. The number of exhibits in the Agricultural section was 559 and in the Industrial 880, besides cattle and poultry. There were four sections—(1) Horticultural, (2) Agricultural, (3) Poultry and (4) Industrial. The large departmental exhibit was present, and Pusa was also well represented. The agricultural exhibits for competition were fairly numerous. The Department contributed Rs. 300.

Sitamarhi Cattle Show.—This show was held on 19th April 1910. It was not very successful. A sum of Rs. 30 only was awarded for agricultural and industrial exhibits. A sum of Rs. 325 was awarded in prizes to the cattle-show exhibitors. A lantern lecture was given by the Deputy Director and a collection of seeds and agricultural implements was sent by the Agricultural Department. The Department contributed Rs. 200 to the funds.

Singheswar Agricultural and Industrial Exhibition.—This exhibition was held from the 10th to 14th March in connection with the annual fair at Singheswar. The Agricultural Chemist to the Government of Bengal was present and also the Divisional Agricultural Inspector. The total number of exhibits of all classes this year was 1,848, against 1,479 in the previous year. A number of improved agricultural implements and a large variety of approved seeds were exhibited by this Department. As a result of the last year's exhibition, it is reported that over 40 Meston ploughs are now in use in the Madhipura subdivision. The important feature of the exhibition was the distribution of special prizes to a number of cultivators who adopted improved methods of cultivation and exhibited the crops grown under such improved methods. The total amount paid in prizes was Rs. 1,000, against Rs. 824-2 of the previous year. The Department contributed Rs. 180 towards the fund.

Dumka Agricultural Exhibition.—The exhibition commenced on the 11th February 1910 and lasted till the 16th. On account of the bad harvest in the district there was no exhibition held in the previous year. Special prizes were awarded for cotton. The exhibitors were mostly Sonthals. A sum of Rs. 403-8 was awarded as prizes to the successful exhibitors. The grant-in-aid from the Department was Rs. 100.

Khagra Industrial and Agricultural Show.—At the suggestion of Mr. A. H. Vernède, I.C.S., the Collector of the district, this show was revived last year and was held on the 1st February 1910. The local exhibits consisted of varieties of grains, vegetables and agricultural implements. Mr. C. S. Taylor, Agricultural Chemist to Government, attended the show. The Agricultural Inspector of the Bhagalpur Division also attended and gave lectures and demonstrations. In the industrial section there was a large number of exhibits. The Agricultural Department made a grant of Rs. 100.

Kurseong Horse and Flower Show.—As in former years, the show was held on Easter Monday (28th March 1910). There were not many entries of horses and very few exhibits

in cattle were received. No flower show was held owing to paucity of entries consequent on the unfavourable weather and the early date of the show. Government did not contribute to the funds.

Bagdogra Mêla (Darjeeling Terai).—The *mêla* was held this year from 2nd to 16th February 1910, both days inclusive. The number of animals exhibited was 1,473 as against 1,536 in the previous year, but the quality of the cattle was much better. The total amount of prizes was Rs. 188, viz., Rs. 57 for cattle and Rs. 131 for agricultural and industrial exhibits. The Agricultural Inspector of the Division attended the *mêla* with improved agricultural implements and seeds, and gave a lantern lecture. The agricultural and industrial show in connection with the *mêla* is being much more appreciated by the Terai *jotedars* than before. Government contributed Rs. 150 in aid of the *mêla*.

Kalimpong Mêla.—This *mêla* was held on the 1st and 2nd December 1909. As usual it attracted a good attendance of natives from the district, but the number of European visitors was less than usual. The exhibits consisted of ponies, mules, donkeys, Siri cattle, other cattle, sheep, goats, pigs, dogs, poultry, grains, roots and vegetables, fruits, plants and flowers, dairy produce, forest produce and outturn of local industries. The total number of entries in all sections was 1,262, and was rather more than that of last year. Prizes to the value of Rs. 1,171-8 were awarded to the successful exhibitors. Government contributed Rs. 675.

Sambalpur Agricultural and Industrial Exhibition.—The fifth annual show was held from 21st to 25th January 1910. A fairly large number of exhibits were shown in three sections, viz., Agricultural, Cattle and Industrial. Mr. Hoogewerf, Principal of the Serampore Weaving School, showed the working of some improved looms The Divisional Agricultural Inspector delivered a lantern lecture and demonstrated the working of the improved implements. Rupees 810, besides four silver medals were awarded, as prizes. The Department contributed Rs. 300 to the fund.

Jajpur Agricultural and Industrial Exhibition.—This was the first exhibition in this subdivision. It was held on 21st January 1910. About 1,200 industrial and 1,500 agricultural exhibits were catalogued and arranged on the stalls, and many had to be returned for want of space after the 21st January. There was a flower show on the second day, 22nd January. There was a cattle and poultry show on the third day. The Superintendent of the Cuttack Agricultural Station demonstrated *gur*-making and ploughing and delivered lectures on agricultural matters. The total number of exhibits rewarded was 311, and the amount spent in prizes and certificates was Rs. 1,600. Out of these 20 Meston ploughs were awarded to enterprising cultivators. The Department contributed Rs. 300 to the funds.

Angul Agricultural and Industrial Exhibition.—The seventh exhibition was held from 5th to 8th February 1910. The total number of exhibits this year was double of that of the preceding year, being 2,089 against 1,069. It is worth noting that the agricultural exhibits were treble those of the preceding year. The Divisional Agricultural Inspector gave magic lantern lectures which were highly appreciated. None of the Gurjat Rajas subscribed to the exhibition and, with the exception of the Raja of Talcher, none attended it. For want of funds Rs 300 only were distributed as prizes. The Department contributed Rs. 300. The Hon'ble Mr. M. S. Das, C.I.E., gave three silver medals as prizes.

Chaibassa.—The Agricultural and Industrial Exhibition at Chaibassa was held on the 3rd and 4th January 1910. It was on a more extensive scale than in previous years. The Agricultural Department sent a large number of exhibits, and an open-air lecture with a magic lantern was given. Rupees 299 was distributed as prizes. A special feature in the *mêla* was an exhibition of the various processes in the manufacture of shellac from the raw material. From 10,000 to 15,000 people visited the show. The Department contributed Rs. 200.

Hazaribagh.—The fourth Annual Agricultural Fair and Cattle Show of Hazaribagh was held from 12th to 19th February 1910. The Commissioner of the Chota Nagpur Division granted Rs. 300 to the show and a sum of Rs. 50 was subscribed locally. The exhibits consisted chiefly of (1) live-stock, (2) agricultural produce and implements, and (3) vegetables and flowers. Prizes to the value of Rs. 62-8 were awarded. The fair did not attract a very large number of exhibitors. But the exhibition is yet in its infancy.

Purulia Agricultural and Industrial Show.—The sixth Agricultural and Industrial Show was opened on the 24th February 1910. There were altogether 616 exhibits, consisting of cattle, poultry, grains and pulses, garden produce, fruits and works of local arts and industries. Prizes to the value of Rs. 408 were awarded for agricultural products. The Agricultural Department sent several exhibits, consisting of agricultural implements, seeds and manures, etc. The Inspector in charge explained to the spectators the utility of the various exhibits. Government contributed a sum of Rs. 300 in aid of the show.

Chutia.—The third Ranchi Agricultural, Horticultural and Industrial Exhibition and Cattle Show was held on the 1st February 1910 and was open for three days. This year it was open to the whole Division. The exhibition was very successful. Upwards of 3,000 exhibits were received. In the Agricultural section the exhibits were fairly numerous. A sum of Rs. 729 was distributed in prizes. There was a very large crowd at the exhibition. An Inspector of the Civil Veterinary Department assisted in the judging of the cattle. The Deputy Director of Agriculture, Mr. F. Smith, represented the Agricultural Department at this show, and the work of demonstration was very successfully carried out by

the Divisional Agricultural Inspector. The former gave a magic lantern demonstration to the public on the first day. A sum of Rs. 400 was contributed by the Department to the funds.

APPENDIX III.

MEMORANDUM OF THE PRINCIPAL FUNGUS DISEASES OF CROPS AND ECONOMIC PLANTS OF BENGAL DEALT WITH BY THE MYCOLOGICAL LABORATORY AT PUSA DURING THE YEAR ENDING 30TH JUNE 1910, KINDLY SUPPLIED BY THE IMPERIAL MYCOLOGIST.

Wilt disease of rahar (*pigeon-pea*).—The investigation of this disease, which has been in progress for several years, was terminated, and an account of it and of its cause and the direction in which its prevention is possible was published in the Memoirs of the Department of Agriculture in India, Volume II, No. 9, January 1910.

Sugarcane diseases.—Several of these are being studied at Pusa, but the work is not yet sufficiently advanced for publication.

Tea diseases.—The most important new work of the year was the investigation of the outbreak of blister blight (*Exobasidium vexans*) in tea in the Darjeeling district by Mr. W. McRae, Officiating Imperial Mycologist. An account of the disease with suggestions for its control was published in the Agricultural Journal of India, April 1910, and a fuller description is in the Press as a bulletin. Other tea diseases are under study.

Paddy.—The disease called *woofra*, *dakhina*, etc., was reported on paddy plants from several districts. While there is little doubt that this is the destructive disease known as *brusone* or *blast* in other countries, its cause is still obscure and further investigation is desirable.

Minor investigations.—The life history of *Phytophthora Colocasiae*, which causes a blight of *kachu*, was worked out and also less completely that of a Phytophthora disease of seedling castor. A stem disease of papaya, probably caused by a species of *diplodia*, the *wither* tip of citrus fruits (*Colletotrichum gloeosporioides*), root rot (*Rhizoctonia*) of linseed, potatoes, brinjals, jute, etc., and some ripe rots of fruit and vegetables occurring at Pusa, were studied. A number of specimens were sent in by planters, district officers and members of the Agricultural Department for report, and the cause of the disease and suggestions for treatment, where possible, were furnished in each case.

APPENDIX IV.

MEMORANDUM OF INSECT-PESTS REPORTED FROM BENGAL DURING THE AGRICULTURAL YEAR 1909-10, KINDLY SUPPLIED BY THE IMPERIAL ENTOMOLOGIST.

1. Letter dated 9th July 1909, from the Superintendent, Hazaribagh Central Jail, sending some beetles which damaged green vegetable plants, and reporting that the prisoners' wards were infested with bugs. The beetles were identified as *Aulacophora foveicollis, kust.*, and remedial measures against both the beetle pest and the bugs were suggested.

2. Letter dated 31st July 1909, from C. S. Drake-Brockman, Esq., reporting much trouble from the white-ants at Ranchi. Suitable methods of eradicating them were suggested.

3. Letter dated 14th August 1909, from the Economic Botanist to the Government of Bengal, sending specimens of caterpillars which were damaging in patches the *urid* crop at Sabour. The caterpillars were identified to be those of *Diacrisia, obliqua*, Wlk. (the Behar hairy caterpillar.)

4. Letter dated the 8th August 1909, from P. Jones, Esq., Benipore, sending specimens of insects attacking *aus* paddy. The pest was identified as the rice bug, *Leptocorisa varicornis*, Fabr.

5. Letter dated 28th August 1909, from Rai Money Lal Banerjee Bahadur, zamindar, Kidderpore, sending two pests of paddy for identification and advice as to the best method of checking their ravages. The pests were identified as the rice *hispa* and the rice *skipper* (*Hispa asnescens*, Baly., and *Parnara mathias*, F., respectively) and suitable remedies were recommended.

6. Letter dated 25th September 1909, from N. V. Reid, Esq., of Lalseriah P. O., Champaran, sending stems of *juari* plants attacked by a caterpillar. The culprit was found to be the common cane borer, *Chilo simplex*, Butl.

7. E. R. Macdonald, Esq., of Barah, Bara Chakia, Champaran, reported a bad attack of a caterpillar pest on his Java indigo plants, and sent specimens for identification on 6th October 1909. The caterpillars were found to be those of a Tineid moth, *Ypsolophus ochrophanes*, Meyr.

8. The Economic Botanist to the Government of Bengal sent for identification specimens of insects attacking top-shoots of *sann* (*Crotalaria juncea*). The insect was identified as *Laspeyresia pseudonectis*, Meyr.

9. Letters from the undernoted officers were received during October and November 1909, forwarding specimens of insects which were doing immense damage to the standing *rabi* crops in the Tal lands.

(1) Deputy Collector in charge khas mahals.
(2) Agricultural Inspector, Patna Division.
(3) Commissioner of the Bhagalpur Division.

The pest was found to be the greasy surface caterpillar—*Agrotis ypsilon*, Roth.

10. Letter dated the 4th January 1910, from the Superintendent, Royal Botanic Gardens, Calcutta, forwarding specimens of insects (attacking mango trees), received by him from the Forest Ranger, Sonthal Parganas, for identification and suggestion of remedical measures. The pest was identified as *Psylla cistellata*, Buck, and suitable recommendations to check its spread were made.

11. Letter dated 26th March 1910, from G. H. Foley, Esq., Mithapore P. O., Bankipore, reporting occurrence of mango blight and offering his trees to be experimented on. As experiments with mango blight were not being carried out at that time, advantage could not be taken of his offer.

12. Letter dated 16th May 1910, from the Superintendent, Viceregal estates, Calcutta, sending some insects attacking palms at Government House. The insects were found to be the caterpillars of *Psychid* moths and methods of destroying them were suggested.

13. Letter dated 25th May 1910, from C. Bergtheil, Esq., Director, Sirsiah Research Station, forwarding specimens of insects attacking indigo plants at Dumra, Sitamarhi. The insects were found to be *thrips*.

14. Letter dated 31st May 1910, from P. W. Goodwin, Esq., Kalimpong Demonstration Farm, sending a moth (for identification), caterpillars of which badly damaged the gram crop. The moth was identified as the gram pod-borer (*Chloridea obsoleta*, F.)

APPENDIX V.

A list of Agricultural Implements and Machines tested in Bengal during the year ending 30th June 1910 and of those in use which are reported to have met with success.

No.	Designation of implements.	Use.	Special advantage.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by cultivators.
1	2	3	4	5	6	7	8	9
1	Threshing machine.	Threshing of crops.	Economy in labour.	Rs. A. 3,450 0	Messrs. Marshall Sons & Co., Calcutta.	W. S. Irwin, Manager, Motihari Indigo Concern.	Working satisfactorily.	Only used in factories.
2	Ditto ...	Threshing and clearing wheat, barley and oats.	Far superior to the country system of treading by bullocks. Turns out about 200 maunds of grain in a day.	3,500 0	Messrs. Arthur Butler & Co., Muzaffarpur.	Manager, Hathwa Farm.	A large farm should not be without it.	.....
3	Sheaf elevator for threshing machine.	Ditto ...	Economy in labour.	625 0	Messrs. Marshall Sons & Co., Calcutta.	W. S. Irwin, Manager, Motihari Indigo Concern.	Working satisfactorily.	Only used in factories
4	Reaping machine	.....	Ditto ...	1,200 0	Ditto ...	Ditto ...	Ditto ...	Ditto.
5	Albion reaper ...	Cutting oats, barley and wheat.	Cheapness and rapidity in cutting and also the manner in which it cuts fallen corn.	450 0	Ditto ...	Manager, Hathwa Farm.	Can be recommended for large agricultural farms. Cuts about 10 acres a day.	.....
6	Chaff-cutting machine.	Chaffing fodder ...	Superior to the hand-power machine. Cuts about 200 maunds in 8 working hours.	450 0	Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	Can be highly recommended for large farms, where a large number of cattle is kept.	.....
7	Corn-crushing machine.	Crushing grain for cattle and horse.	Cheapness and rapidity in crushing. Can be worked by hand- and steam-power.	125 0	Messrs. Jessop & Co., Calcutta.	Ditto ...	Suitable for cattle-breeding, agricultural farms and stables.	.....
8	Cabelt's winnowing machine.	Separating dust and small chaff from grain.	Can be used for cleaning grains in the absence of wind.	200 0	Messrs. T. E. Thomson & Co., Calcutta.	Ditto ...	Can be well recommended for large farms.	.....
9	Maize-huller ...	Separating seeds from cobs.	The separation is effected soon.	35 0	Department of Agriculture, Bengal.	Dewan of Barasambar zamindari.	Efficient	Used in Barasambar zamindari in Sambalpur district.
10	"Simplex" hand-power chaff-cutter.	Cutting chaff out of the paddy straw for feeding cattle.	Rapidity and efficiency.	42 6	T. E. Thomson & Co., Calcutta.	Ditto ...	Do.	Ditto.
11	Iron *dón*	Lifting water ...	Best, cheapest, simplest and most economical water lift for lifting water from small depth.	7 8 to 9 0	Native blacksmiths at Gushkara and several places in Birbhum.	Collector of Bankura.	The advantage is being gradually appreciated.	Used to a limited extent.
12	Pitchers sport pump.	Pumping up water from tanks, etc.	The machine is of special advantage where the water is in a tank of high bank, so that ordinary baling systems in use in the country in these tanks are not practicable.	12 0 or above.	Messrs. Jessop & Co. and Messrs. Burn & Co.	Rajendra Nath Banerjee, member, District Agricultural Association, 24-Parganas.	In this portion of the country (24-Parganas) where agriculturist are, more or less, prone to idleness, this machine is of special interest and use. The few demonstrations the reporting officer had in the assemblies of country cultivators have excited much commendation in its favour.	.....
13	Challenge double-acting force pump.	Pumping water from 20 feet depth.	Only one man can work it and draw up water from a depth of 20 feet and raise it to a height of 60 feet.	86 0	Messrs. T. E. Thomson, Calcutta.	Ditto ...	Very suitable for small gardening. The machine is very strong and active.	At present the use is not encouraging, but the cultivators have been convinced of its advantage.

No.	Designation of implements.	Use.	Special advantage.	Price.	Where procurable.	Name and designation of reporting officer.	Opinion.	Extent to which used by cultivators.
1	2	3	4	5	6	7	8	9
14	*Lata khota* ...	To lift water from deep wells as well as from tanks.	Cheapness, easiness of construction by an ordinary cultivator, saving of considerable labour.	Rs. A. 12 0	It can be constructed by any person of ordinary skill. Available also in the North-Western Provinces.	Kanak Roy, member, District Agricultural Association, 24-Parganas.	Experiments in Hirigalgunge were very successful.	At present the use is not so much encouraging, but the cultivators have been convinced of its advantage.
15	Gwynn's 8 centrifugal pump.	Lifting water from rivers and tanks.	Lifts water for watering 15 acres of land in a day.	.....	Messrs. Jessop & Co.	Manager of the Hathwa Farm.	Can be will recommended for large farms, where irrigation is absolutely necessary.	...
16	Hindustani plough	Ploughing heavy soil.	More effective than country plough.	14 8	Leslie & Co., Calcutta.	Collector, Bankura, and Secretary, District Agricultural Association.	Ploughs the land to a greater depth than the country local plough, and makes the tillage uniform.	Used to a very limited extent.
17	Meston plough ...	Ploughing light soil.	Ditto ...	4 8 to 5 0	Agricultural Department, Bengal, and Messrs. Ram Narayan Banerjee and Sons, Howrah.	Collector of Bankura and Subdivisional Officers of Khurda and Madhipura.	The plough is proving useful and is being appreciated.	Ditto.
18	Sibpur plough ...	Deep ploughing and breaking soil.	Strong and lasting; good in saving labour and time.	10 8 to 12 0	Agricultural Department, Bengal.	Two members of the District Agricultural Association, 24-Parganas and Deputy Commissioner, Angul.	Soil is dug and turned up deeper and at the same time more easily. Very suitable for cultivation of sugarcane and potatoe-fields.	Used in the Demonstration Farm, Angul, but it is too heavy for the ordinary bullocks of the district.
19	Howard's plough No. 2.	Ploughing ...	It breaks the soil and inverts it.	50 0	Messrs. T. E. Thomson & Co., Calcutta.	Manager of Hathwa Farm.	It is useful on all kinds of soil. Very strong and entirely made of iron.	Used in Hathwa Farm for several years.
20	Planet junior hand hoe.	Hoeing	Very useful in making ridges.	15 8 to 40 11	Messrs. T. E. Thomson & Co., Calcutta, and Agricultural Department, Bengal.	Four members of the District Agricultural Associations, 24-Parganas and Purnea, and Manager, Syedpore Trust estate.	Hoeing and weeding are effected more easily and quickly than in the local method.	At present the use is not encouraging, but the cultivators have been convinced of its advantages.
21	Behia Sugarcane Mill.	Crushing sugarcane.	Portable and effective Juice can be extracted in a short time with less labour and expense.	60 0 to 200 0	Messrs. Thomson and Mylne, Behia, Shahabad.	Collector of Bankura and Deputy Commissioner, Angul.	Cultivators have appreciated the value of the machine.	Extensively used by cultivators.
22	Banerjee's pattern three-roller iron sugarcane crushing mill.	Ditto ...	More effective than local wooden mills.	63 13	Messrs. Banerjee and Sons, Howrah.	A member of the District Agricultural Association, Sambalpur.	From the same quantity of canes more juice is obtained with less labour than from the local wooden mill.	Used in the Baras o m bar zamindari private estate, Sambalpur.
23	Banerjee's pattern iron evaporating pan.	Manufacturing molasses.	A large quantity of clean *gur* is prepared in comparatively less time.	...	Ditto ...	A member of the District Agricultural Association, Sambalpur, and Tahsildar, Khurda.	Cleaner and gives better crystallized *gur* than is obtained the earthen pots used at present.	Ditto.
24	Behia sugarcane juice-boiling pans.	Ditto ...	A large quantity of juice can be boiled at one time and the froth removed easily.	60 0	Messrs. Thomson and Mylne, Behia, Shahabad.	Deputy Commissioner of Angul.	Very useful and appreciated by Government tenants.	Used largely by cultivators.
25	Donaldson's Oil Mills.	Crushing mustard and linseed.	Far superior to local wooden *kolha*. Turns out half a maund of oil in a day.	130 0	Messrs. Jessop & Co., Calcutta.	Manager, Hathwa Farm.	Can be recommended for oil merchants.	.....
26	Eclair Vaporizer	Applying insecticides to diseased crops.	Useful for spraying. Can be easily carried by one man.	50 0	Ditto ...	Ditto ...	Can be recommended for small holdings and small farms.	.....
27	Wright's Fibre Decorticator.	Extracting fibre from *rhea*, *mung*, sunhemp, etc., and almost from every kind of fibre plant.	.....	...	Messrs. Ewing & Co., Calcutta.	F. M. Coventry, Planter, Dalsingh Serai.	The principle of decorticator is one of combing, a great improvement on the old system of beaters and the loss of fibre is small.	Not used anywhere else in India at present.
28	Three-tined Madras Seed-Drill.	Drilling paddy in lines.	Preventive of wastage of seeds, which occurs by broadcasting paddy.	7 2	Department of Agriculture, Madras.	Member of the District Agricultural Association, Sambalpur.	The implement requires a practical hand and a pair of trained bullocks.	.....

APPENDIX VI.

Expenditure on miscellaneous experiments and enquiries during the year ending the 30th June 1910 other than those carried out in Agricultural stations.

	Rs.	A.	P.	Rs.	A.	P.
Central Seed Store	...			14,206	1	1
Supplies and services—						
Seeds	5,616	8	6			
Manures	381	5	0			
Implements	2,875	13	3			
Other charges	3,418	5	1			
Establishment—Pay of	1,914	1	3			
Special crops	...			38,750	0	0
Contribution to Behar Indigo-Planters' Association	32,500	0	0			
Ditto to Tea Association	3,500	0	0			
Ditto for Flax Experts	2,750	0	0			
Agricultural Associations	...			16,888	10	7
Central Association	1,801	11	7			
Contribution to Divisional and District Agricultural Associations	6,000	0	0			
Establishment—Pay and travelling allowance of Agricultural Inspectors and peons	9,086	15	0			
Distribution of Agricultural literature	...			3,596	2	3
Printing at private presses and miscellaneous expenses	3,596	2	3			
Expert staff	...			2,600	4	1
Pay and travelling allowance of Travelling Inspectors and Supernumerary officer	2,600	4	1			
Miscellaneous	...			60,818	10	8
Contribution to agricultural and cattle fairs ...	6,825	0	0			
Cost of exhibits (implements, etc.)	1,267	5	0			
Carriage of implements and miscellaneous expenses	1,386	13	0			
Temporary Establishment—Pay of	230	15	0			
Contribution to Deoghar School	360	0	0			
Sericulture	47,288	5	8			
Deputation of students to foreign countries ...	3,460	4	0			
	1,36,859	12	8	1,36,859	12	8

P. S. Press—16 9-1910—2081—635—W. M. D'U.

REVENUE DEPARTMENT.

AGRICULTURE.

DARJEELING, THE 17TH OCTOBER 1910.

RESOLUTION No. 2122T.—R.

READ—

The Report of the Department of Agriculture, Bengal, for the year ending the 30th June 1910.

Charge.—The Department of Agriculture was under the charge of Mr. W. R. Gourlay, I.C.S., up to the 10th February 1910, and then of Mr. W. H. Buchan, I.C.S.

2. *Organization.*—Proposals for the organization of a permanent staff for the Agricultural Department are now under the consideration of the Government of India. They are confined to present requirements, including those of the Provincial Agricultural College.

3. *Agricultural Stations.*—No new agricultural station was opened during the year. The Lieutenant-Governor agrees that no more stations should be started until those that have been opened are placed on a proper footing and men have been trained to take charge of new ones.

4. *Scientific Experiments.*—The Agricultural Chemist conducted a series of experiments on the periods of maturity of certain varieties of Bengal sugarcane. His observations have resulted in fresh knowledge of their sugar-yielding qualities, which will shortly be published as a record of the Department. The cultivation of sugarcane by the Bihar Planters' Association was not successful. The Economic Botanist made good progress in his plant-breeding work. A number of experiments with jute were carried out at the Cuttack Agricultural Station, and the authorities of the Hastings Jute Mill have reported favourably on the quality of the jute produced; but as the crop was heavily manured and the cultivation expensive, it is not likely that cultivators will profit directly by such experiments. It is reported that jute cultivation has been practically abandoned by the planters in Bihar in consequence of the fall in prices.

The prospects of the cultivation of cotton have not so far been very promising in this Province. At the instance of the Imperial Cotton Specialist, who visited Sabaur and other places during the year, further experiments are being made with the most promising varieties.

Mr. E. Vandekerkhove, the Belgian Flax Expert, continued his work at Dooriah in the district of Muzaffarpur under agreement with the Bihar Planters' Association. The detailed results of his work have been separately published by the Association. The flax produced obtained a good price on the market and the experiment gives great promise of success.

In addition to these special experiments a large number of experiments and demonstrations were conducted throughout the Province by members of Agricultural Associations and some progress was made in popularising new crops and improved methods of agriculture. The Director of Agriculture has at present under consideration a scheme for organizing these isolated experiments and demonstrations so as to make them more useful to the public.

5. *Sericulture.*—The operations for the improvement of the silk industry in Bengal, now conducted under the general control of a committee consisting of the Director of Agriculture, the Collector of Murshidabad, and four representatives of the principal silk firms in Bengal, have made some progress under the superintendence of Babu Apurba Kumar Ghose. The main object is to rear and distribute pure and healthy seed as widely as possible in the silk-rearing districts, through the agency of village nurseries. Six new nurseries

were established during the year—three in the Murshidabad district, two in Birbhum, and one in Midnapore. Altogether there are now eighteen nurseries. The experience of the year shows that progress is being made in the eradication of the disease known as *pebrine*, which was one of the principal causes of the decline of the silk industry. The seed of the nurseries is growing steadily in popularity in the Bengal districts, and requisitions for it were received from Rajshahi and Malda in Eastern Bengal and Assam, and from Belgaum, Hyderabad, Ahmedabad, Gwalior, and other parts of India. To meet the increasing demand two more rearing houses were added to the Central Nursery at Berhampore. The total receipts from the sale of seed amounted to Rs. 6,566 as compared with Rs. 5,874 in the preceding year, and there was a small profit on the working of the nurseries. The experiments made with Italian mulberry in the Central Nursery and those made at Calcutta in the cold storage of seed and cocoons obtained some success. A class for the training of the sons of rearers has been established in the Central Nursery at Berhampore. The course of instruction extends over a year, and six stipends of Rs. 8 a month have been founded. There are six boys now under training.

6. *Agricultural Education.*—The Provincial Agricultural College at Sabaur is now ready and work will be commenced in November. The staff in residence consists of a Principal, an Agricultural Chemist, an Economic Botanist, Assistant Professors of Agriculture, Botany, Mycology and Entomology, an Assistant Mycologist and an Assistant Entomologist; and the employment of an Assistant Professor of Chemistry, Physics and Mathematics, and a Demonstrator in those subjects has recently been sanctioned. In the first year only about 20 students will be admitted, of whom one-third will come from Eastern Bengal and Assam.

No progress has been made in the matter of agricultural education in ordinary schools. The question of improving the agricultural classes opened in the Cuttack, Gaya, Dumraon, Hazaribagh, and Burdwan Schools has recently been considered by a Board of Examiners, on whose recommendation Government has ordered the classes at Burdwan, Hazaribagh, and Cuttack to be closed for the present. The question of teaching agriculture in certain selected high schools is now under consideration, but the great difficulty is the want of suitably trained teachers, and no great progress in this direction can be expected till these are provided.

The practical training of the sons of cultivators was continued, principally at the Cuttack Farm. An attempt is being made to extend the system to other farms with the help of the local Agricultural Associations.

7. *Agricultural Associations, Fairs, and Shows.*—The Lieutenant-Governor notices with satisfaction that the members of the Patna and Orissa Divisional Associations and of the Sambalpur District Association continued to take much interest in the improvement of agriculture. With the opening of the College at Sabaur, the Bhagalpur Divisional Association will have opportunities for extending its activities.

The Director has drawn attention to the specially useful work done in connection with Agricultural Associations by Babu Sarada Charan Mitra, Rai Lalit Mohan Sinha Roy Bahadur of Chakdighi, and Babu Purnendu Narayan Sinha, Secretary to the Patna Divisional Association.

The fairs and shows held during the year, of which a brief account is given in Appendix II to the Report, received grants-in-aid irom Government aggregating Rs. 6,978. Arrangements are being made to render these shows more useful auxiliaries to the Department.

8. The well-boring operations made very little progress during the year, only 38 borings having been made in the districts of Gaya, Bhagalpur, Patna, Shahahad, and Champaran. The question of the controlling agency, on which success largely depends, is now under the consideration of the Director.

9. *Publication of Agricultural information.*—Besides the Quarterly Journal of Agriculture, the Department published and circulated widely leaflets on a number of subjects in English and the vernaculars.

10. *Fisheries.*—On the completion of the fishery survey of the Bay of Bengal, the control of the Fishery Department was, in accordance with the arrangement prevailing in most European countries, made over to the Director

of Agriculture on the 15th January 1910. In future the enquiry will be confined to the inland fisheries of the Province. The present staff consists of two assistants—Mr. B. Das and Mr. M. Mohsin—who have visited various fishing centres in Europe and America and have acquired a general knowledge of the functions of a Fishery Department. During the year under report these two assistants devoted their time principally to two special lines of enquiry, viz. (1) experiments in the artificial propagation of carp, and (2) investigation into the spawning grounds of *hilsa*. A scheme for the future conduct of the fishery operations is now under the consideration of the Government of India.

11. *Indigo.*—Mr. C. J. Bergthiel continued his research work at Sirsiah. No results have yet been obtained of sufficient finality to warrant publication.

12. *Conclusion.*—The thanks of the Lieutenant-Governor are due to Messrs. Gourlay and Buchan for their administration of the Department. His Honour also notices with satisfaction the good work done by the several officers mentioned in paragraph 72 of the Report.

ORDER.—Ordered that this Resolution be published in the *Calcutta Gazette*, and that a copy of it, with a copy of the Report, be submitted to the Government of India.

By order of the Lieutenant-Governor of Bengal,

W. R. GOURLAY,
Offg. Secy. to the Govt. of Bengal.

No. 2124T.—R.

COPY, with a copy of the Report, forwarded to the Appointment Department of this Government for information.

No. 2125T.—R.

COPY, with a copy of the Report, forwarded to the Director of Public Instruction, Bengal, for information, with reference to paragraph 6 of the Resolution.

No. 2126T.—R.

COPY forwarded to the Secretary to the Board of Revenue, Land Revenue Department, for the information of the Board and for favour of communication to the Director of Agriculture, Bengal.

By order of the Lieutenant-Governor of Bengal,

H. A. F. LINDSAY,
Under-Secy. to the Govt. of Bengal.

DARJEELING,
REVENUE DEPT.—*Land Revenue,*
The 17th October 1910.

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